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Aero Digest, *January, 1934*
Volume 24. Number 1.
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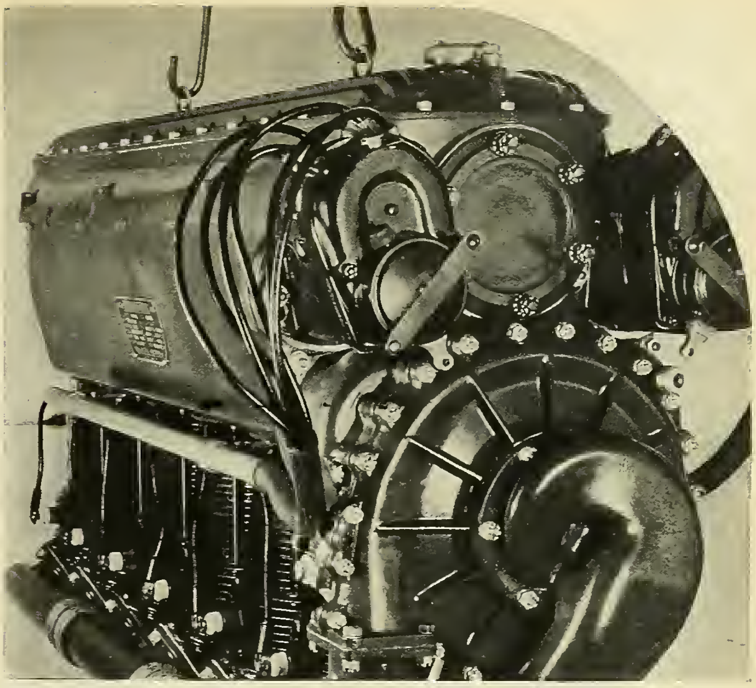

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Ball and Roller Bearings

Above: Modern, tri-motored passenger, mail and express plane in use by W.A.E. in 1933. By way of contrast, note the plane that made the first passenger flight between Salt Lake City and Los Angeles on May 23, 1926. In the picture, left to right, Byron L. Graves; Major C. C. Moseley, Vice-President in charge of operations; George Holley, Director, and Harris M. Hanshue, President, W.A.E.

Elliott Roosevelt, left, was the one-hundred-thousandth passenger of W.A.E. He is congratulating Jimmie James, veteran pilot, upon landing at Salt Lake City after their flight from Los Angeles. In center is Ben F. Redman, Salt Lake City business man, who, on May 23, 1926, was the first W.A.E. passenger and on September 24, 1933, was the one-hundred-thousandth and first.

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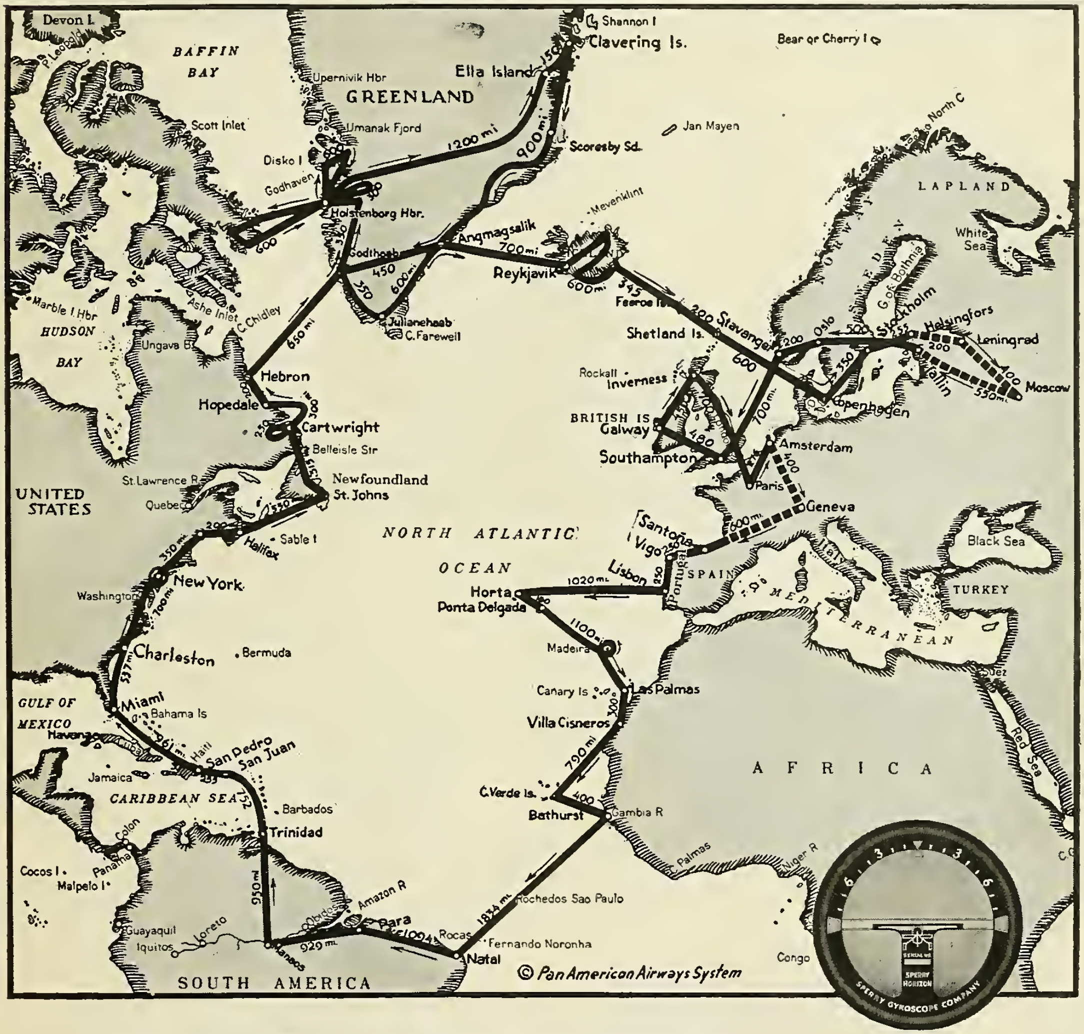

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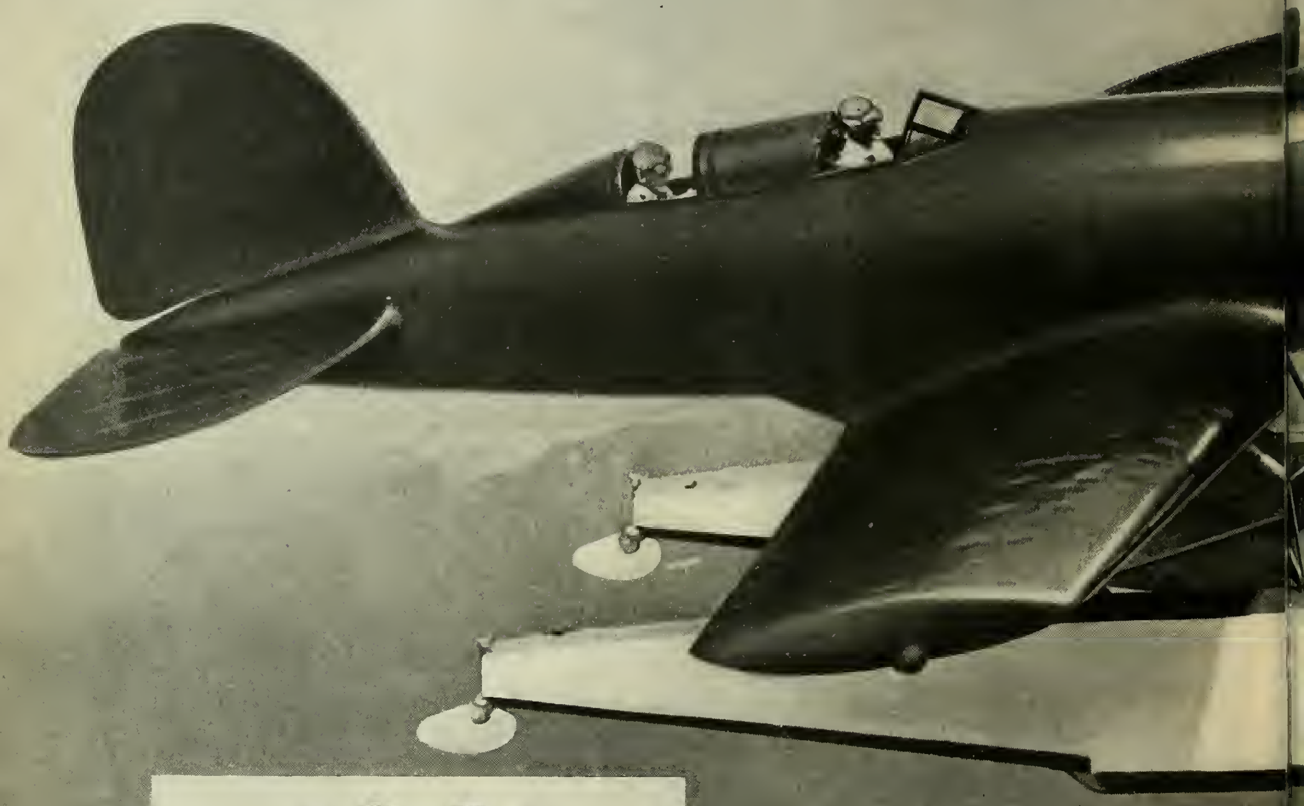

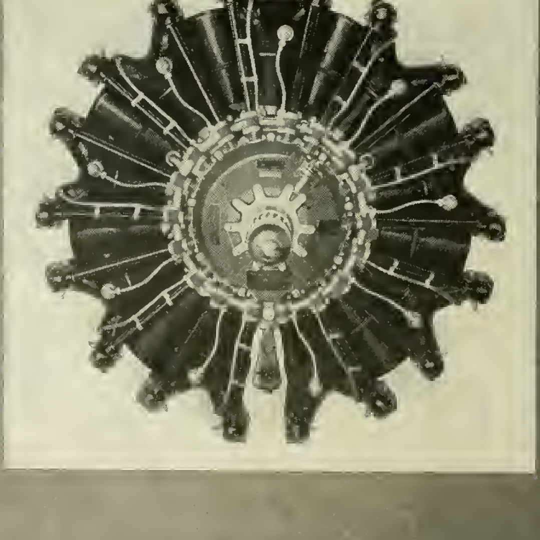

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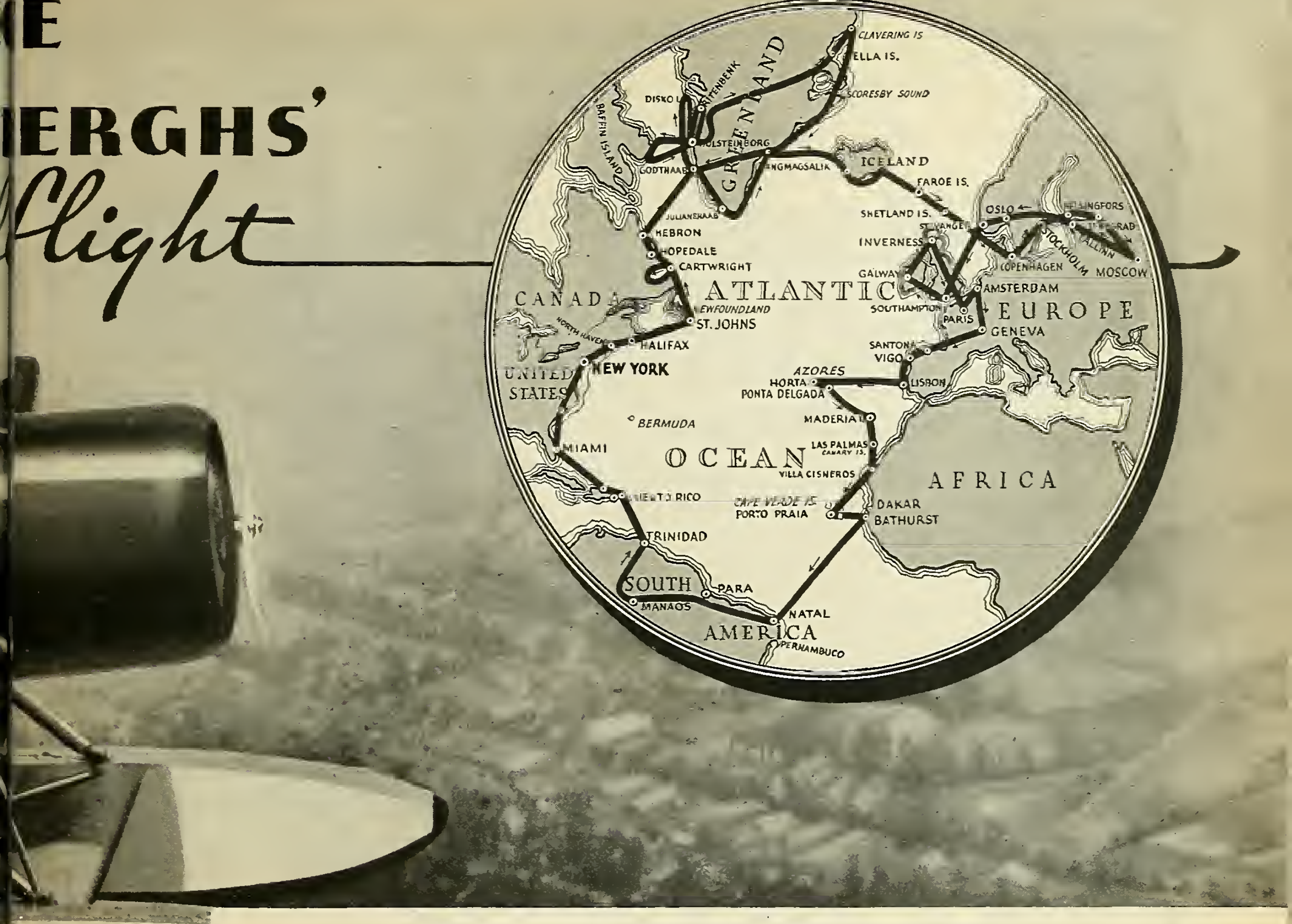

Colonel and Mrs. Charles A. Lindbergh's 30,000-mile flight covering twenty-one nations, including crossings of the North and South Atlantic Ocean, ranks as one of the major flights of history.

During this aerial tour, they visited Labrador, Greenland, Iceland, the British Isles, Europe, the Azores, Africa, South America and the West Indies before returning to the United States. Extremes of climatic conditions were encountered along the route, ranging from the sub-Arctic cold of Greenland and Iceland to the intense heat of tropical regions at the Equator.

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Colonel Lindbergh is technical advisor to Pan American Airways System and Transcontinental & Western Air, two of the world's largest transport systems. From this flight, made in the interest of Pan American Airways System, he brings back technical data and information of greatest importance to the program for an American trans-Atlantic air service.

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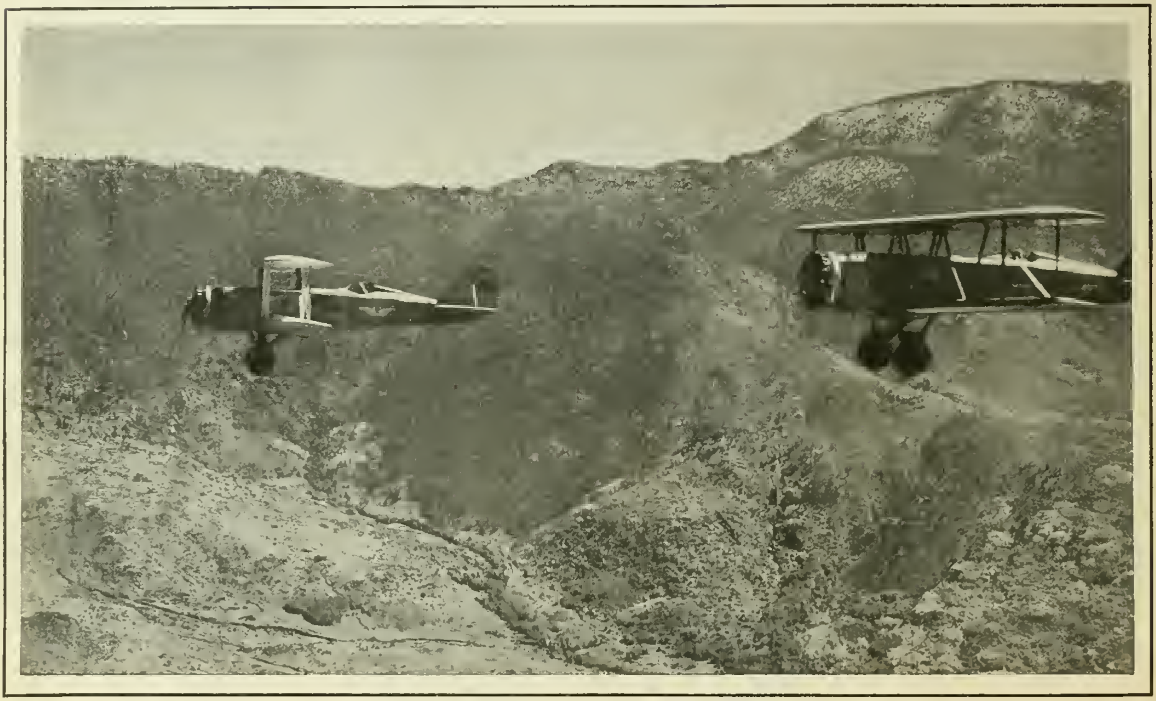

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AERO DIGEST

VOLUME TWENTY-FOUR NUMBER ONE

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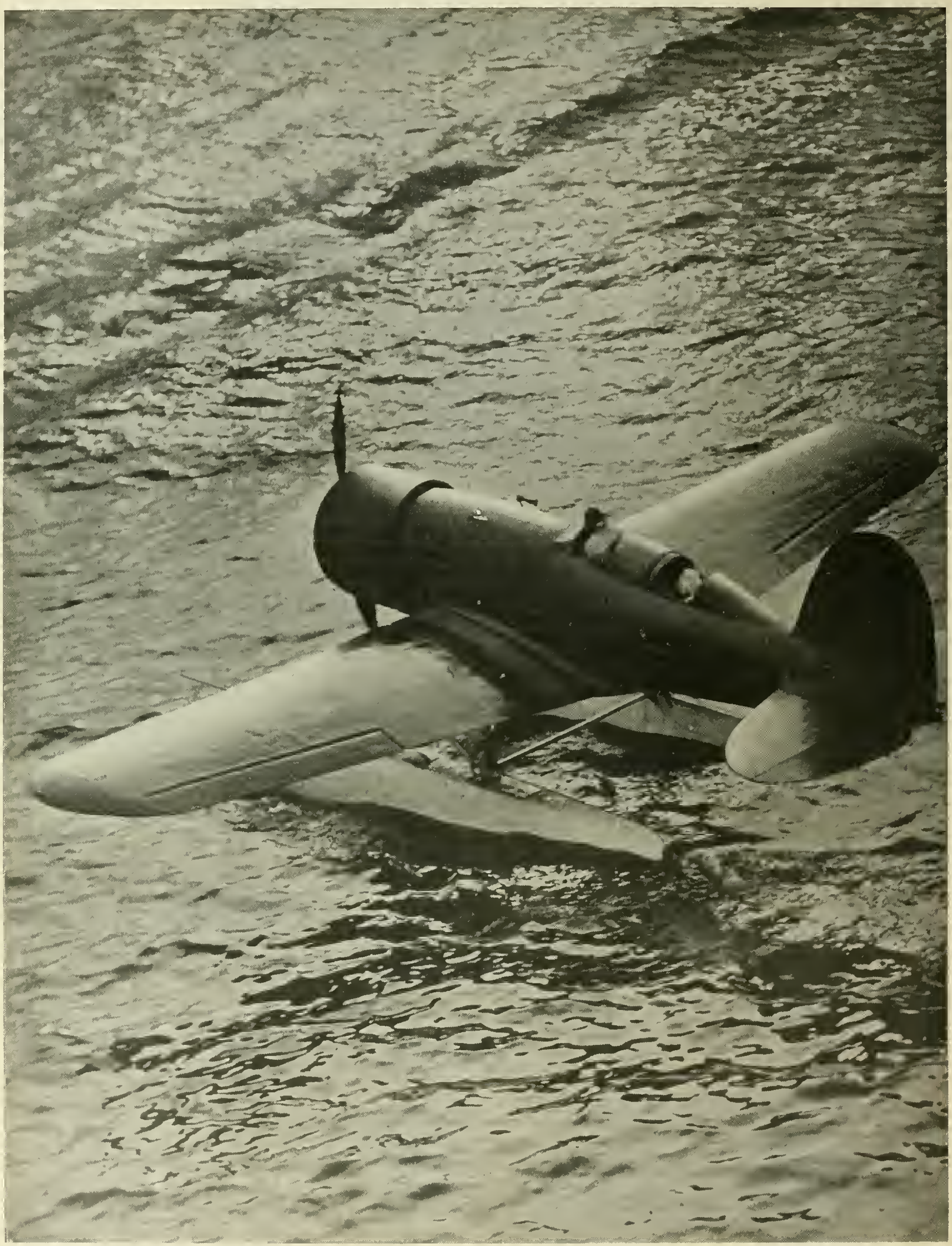


Acme photo

The Lindberghs after landing in New York, completing their recent 30,000-mile flight around and across the North and South Atlantic Oceans

Chronology of Some Important Events of 1933

January

The Fifth Annual All-American Air Races were held at Miami, Florida. Jimmie Wedell made the fastest time, 205.295 miles an hour, in the free-for-all unlimited engine displacement race. (Jan. 5-7)

The *Akron* returned to the Lakehurst, N. J. Naval Air Station after completing an eight-day training trip during which a mooring mast site at Guantanamo was inspected. (Jan. 11)

The Second Brigade, U. S. Marine Corps, arrived at Anacostia Md. after a 2,500-mile flight from Managua, Nicaragua. Twenty-two planes and 59 men made the trip. (Jan. 12)

Jean Mermoz completed his second crossing of the South Atlantic when he flew to Buenos Aires, Brazil, from Istres, France, in 54 hours 33 minutes flying time. His plane was a tri-motored (Hispano Suiza) Couzinet 70. (Jan.22)

February

The $6,000,000 Army air base at Barksdale Field, Shreveport, Louisiana, was dedicated. (Feb. 2)

The world's record for a non-stop flight was broken by Squadron Leader O. R. Grayford and Flight Lieut. G. E. Nicholetts, British Air Force fliers, who landed at Walvis Bay, South West Africa, 5,341 miles from Cramwell, England, their starting point. (Feb. 8)

Capt. James Mollison completed a solo crossing of the South Atlantic at Natal, Brazil, averaging 115 miles an hour from Thies, Senegal, Africa. (Feb. 9)

Eastern Air Transport acquired Ludington Airlines and announced plans to operate it as a division. (Feb. 15)

March

An amendment to the Air Commerce Regulations increased the hours required for a pilot's license from 10 to 50. (Mar. 1)

The plans for a merger of North American Aviation, Inc., and General Aviation Corp. were approved. (Mar. 2)

The *Macon* was christened by Mrs. Wm. A. Moffett in the hangar at the Goodyear-Zeppelin factory in Akron, Ohio. (Mar. 11)

April

The Marqueses of Douglas and Clydesdale, accompanied by Col. L. V. S. Blacker in one plane and in another plane by Flight Lieut. D. F. McIntyre, with S. R. Bonnett, cameraman, flew over Mount Everest on successive days. (April 3-4)

The *Akron* went down at sea off the New Jersey coast, all aboard except one officer, Commander Wiley, and two of the crew being lost, including the chief of the Bureau of Aeronautics, Rear Admiral Wm. A. Moffett. (April 4)

Warrant Officer Francisco Agello of the Royal Italian Air Force set a new world's speed record of 423.77 miles an hour in a Macchi-Castoldi 72 seaplane with an A.S.6 Fiat engine of 2,800 horsepower. (April 10)

The first solo flight from Hong Kong to Manila was completed by Fernando Rein Loring enroute from Spain to the Philippines. (April 10)

The *Macon* made her maiden voyage, cruising about Akron, Ohio, for 13 hours carrying 105 passengers, and commanded by Capt. Alger H. Dresel. (April 21)

May

Amelia Earhart Putnam received the Harmon Trophy in recognition of her solo trans-Atlantic flight. She also was awarded the National Aviatrix Trophy for the U. S.

Capt. Stanislaus Skarzyniski, Polish pilot, arrived at Maceio, Brazil, after a solo flight in a Gypsy Moth across the South Atlantic from San Luis, Senegal, Africa, flying the 2,140 miles in 17 hours 50 minutes. (May 8)

The airship *Graf Zeppelin* completed its first trans-Atlantic crossing of the year on its regularly scheduled service from Friedrichshafen, Germany, to Pernambuco, Brazil. (May 9)

The French Aviatrix, Marsye Hilz, completed a 25,000-mile solo flight from Paris to Tokyo and return. (May 14)

Jean Mermoz completed another crossing of the South Atlantic landing at Dakar, French Africa, from Natal, Brazil, with five persons. (May 15)

June

Warrant Officer Francisco Agello of the Royal Italian Air Force unofficially broke the world's speed record in a Macchi-Castoldi 72 seaplane. He flew at a speed of 440 miles an hour. (June 2)

Lieut. Comdr. Frank Hawks in his Northrop Gamma powered by a twin-row Wright Whirlwind engine, crossed the continent non-stop from Los Angeles to New York in less than 13½ hours, with a De Beeson automatic pilot guiding the ship during the flight. (June 2)

James Mattern landed in Moscow with a new speed record, having flown non-stop from New York on his projected flight around the world. He covered about 4,920 miles in actual flying time of less than 32 hours in his P. & W. Wasp-powered Lockheed *Century of Progress.* (June 3-5)

Capt. Mariano Barberan and Lieut. Joaquin Collar, Spanish Army fliers, made a non-stop flight estimated at 4,906 miles, about 4,500 of which were over water, from Seville, Spain, to Camaguey, Cuba, in a Breguet XIX powered with a 650-horsepower Hispano Suiza engine in a little less than 40 hours. (June 10-11)

A 20-hour eastbound coast-to-coast schedule was inaugurated by United Air Lines with the new Boeing 247 transport planes. (June 11)

The veteran Bellanca monoplane, *Columbia,* was flown by Capt. J. Errol Boyd, Robert G. Lyon and H. P. Davis on a non-stop flight to near Haiti, over a 2,470-mile route. (June 11-13)

July

General Italo Balbo and 24 S.55X Savoia Marchetti flying boats took off from Orbetello, Italy, on a flight to Chicago and A Century of Progress via Amsterdam, Londonderry, Reykjavik, Cartwright and Montreal. (July 1)

A westbound transcontinental record of 11 hours 30 minutes was established by Col. Roscoe Turner flying a P. & W. Wasp-powered Wedell-Williams monoplane in the Bendix Trophy race from New York to Los Angeles. (July 1)

An altitude record of 16,371 feet was set by Alfred K. Hall, Jr., 17 year old pilot, in a Bird biplane over Floyd Bennett Field, Brooklyn, N. Y. (July 2)

The 1933 National Air Races were held at Los Angeles at the Municipal Airport. (July 1-4)

The American Air Races were held at Chicago, Illinois. (July 1-5)

Errol Boyd and Robert Lyon returned from Haiti and landed their Bellanca, *Columbia* at Washington, D. C., after a one-stop 23-hour flight. (July 5-6)

The eastbound transcontinental speed record for women was broken by Amelia Earhart Putnam in a P. & W. Wasp-powered Lockheed Vega. Time 17 hours 7.5 minutes. (July 8)

Capt. Geoffrey de Havilland won the King's Cup race in England flying a plane of his own design powered with a Gypsy Major engine. (July 8)

General Italo Balbo and his squadron of Savoia Marchetti flying boats arrived in Chicago, from Montreal. (July 14)

Lincoln Ellsworth sailed from San Francisco en route to New Zealand to embark for the Antarctic regions on an exploration flight across the South Pole with Bernt Balchen, in a Northrop Delta. (July 15)

Wiley Post took off from Floyd Bennett Field, Brooklyn, N. Y., on a round-the-world flight, in the P. & W. Wasp powered Lockheed *Winnie Mae.* (July 15)

Wiley Post landed at Berlin, Germany, non-stop from New York covering a distance of 3,942 miles. (July 16)

General Italo Balbo and his squadron of Savoia Marchetti flying boats arrived in New York from Chicago. (July 19)

Col. and Mrs. Lindbergh left College Point, Long Island, N. Y., on an aerial survey of a possible air route to Europe from North America via Greenland and Iceland. (July 22)

Wiley Post completed his 15,474-mile round-the-world flight in record time. bringing his Lockheed to a landing at Floyd Bennett Field, Brooklyn, N. Y., in 7 days 18 hours 49 minutes. (July 22)

The Fourth Annual Soaring Contest was held at Elmira, N. Y. (July 10-23)

Capt. and Amy Johnson Mollison made a forced landing in their de Havilland Dragon Moth *Seafarer* at Stratford, Conn., after flying non-stop across the Atlantic from Pendine Sands, Wales. Mrs. Mollison was the first woman to make the east-west flight. (July 22-23)

General Italo Balbo and his squadron left Floyd Bennett Field, N. Y., for the return to Orbetello, Italy. (July 25)

August

Helene Boucher, French aviatrix, set a women's official altitude record for light planes by reaching an altitude of about 19,364 feet near Orly, France. (Aug. 2)

A world's record for endurance flying in a glider was made by Kurt Schmidt who flew a sailplane near Koenigsberg, East Prussia, Germany, for 36 hours 35 minutes. (Aug. 5)

A flight of about 5,656 miles, establishing a new world's record, was made by Lieuts. Paul Codos and Maurice Rossi. They flew non-stop, from Floyd Bennett Field, Brooklyn, N. Y. to Rayak, near Bleirut, Syria. Their plane was a Bleriot monoplane, *Joseph Le Brix*. (Aug. 5-7)

General Italo Balbo and his squadron arrived at Orbetello, Italy, marking the end of their 12,000-mile journey to Chicago and return. The entire flight was made within 45 days. (Aug. 14)

Col. and Mrs. Lindbergh arrived in Copenhagen, Denmark, after spending more than a month exploring Greenland and Iceland. (Aug. 26)

September

Eugene L. Vidal was appointed Director of Aeronautics to head the Aeronautics Branch of the Department of Commerce. In a reorganization of the Branch, Rex Martin was chosen to head the Air Navigation Division and Maj. J. Carroll Cone, the Air Regulation Division.

The International Air Meet and James Gordon Bennett Ballon Race was held in conjunction with a Century of Progress at Chicago, Ill. (Sept. 1-4)

Capt. Franciszek Hynek and Lieut. Zbigniew Burzynsky, Polish balloonists, won the James Gordon Bennett Trophy by landing their balloon 846 miles from Chicago, the starting point. The United States team of Lieut. Comr. Settle and Lieut. Kendall, representing the Navy, won second place (Sept. 21)

A new American distance record was established by Richard C. duPont who flew a distance of 122½ miles in a Bowlus sailplane. (Sept. 21)

Roscoe Turner broke the west-east transcontinental speed record by flying from United Airport, Burbank, Calif., to Floyd Bennett Field, Brooklyn, N. Y., in 10 hours 4 minutes. (Sept. 25)

Three Russian scientists ascended 62,304 feet into the strastosphere for an unofficial world record. (Sept. 30-Oct. 1)

Col. and Mrs. Lindbergh arrived in Moscow, after a flight from Finland and Leningrad. (Sept. 25)

Five Navy seaplanes attached to VP-5F Squadron established a non-stop mass formation flight record when they completed a flight from Norfolk, Va., to Coco Solo, Canal Zone, in 25 hours 29 minutes. The distance is 1,788 nautical miles or 2,059 statute miles.

October

Jack O'Meara established a new glider looping record, 46 consecutive times, at the National Air Pageant. (Oct 7)

Major Alexander deSeversky set a new amphibion plane speed record in a ship of his own design by flying more than 180 miles an hour. (Oct 8)

The *Graf Zeppelin* established a new speed record between Friedrichshafen, Germany and Pernambuco, Brazil, covering the distance in 72 hours 40 minutes.

A delayed opening parachute jump of 23,124 feet, a new world's record, was made by the Russian Army pilot Victor Evecyef. (Oct. 12)

The *Macon* completed a non-stop transcontinental flight from Lakehurst, N. J. to Sunnyvale, Calif., her permanent base. (Oct. 12)

Charles Kingsford-Smith flew from England to Australia in 7 days 4 hours 50 minutes.

Charles Ulm and a crew flew from Feltham England, to Derby, Australia. in 6 days 17 hours 56 minutes. (Oct. 20)

November

The *Graf Zeppelin* left Chicago and Akron for the return to Friedrichshafen carrying passengers and mail. (Nov. 1)

A German flying boat crossed the South Atlantic in about 15 hours after making a stop in mid-ocean where the *Westfalen*, a German motorship, is acting as a floating seaport. (Nov. 8)

James Wedell flew his P. & W. Wasp powered Wedell-Williams monoplane from New York to Miami, non-stop in 5 hours 1 minute, averaging more than 300 miles an hour. (Nov. 19)

Commander T. W. G. Settle and Major Chester L. Fordney reached a height of 61,237 feet, a new official world's record. (Nov. 20)

Col. and Mrs. Lindbergh reached Villa Cisneros, Africa after flying from the Canary Islands. (Nov. 26)

December

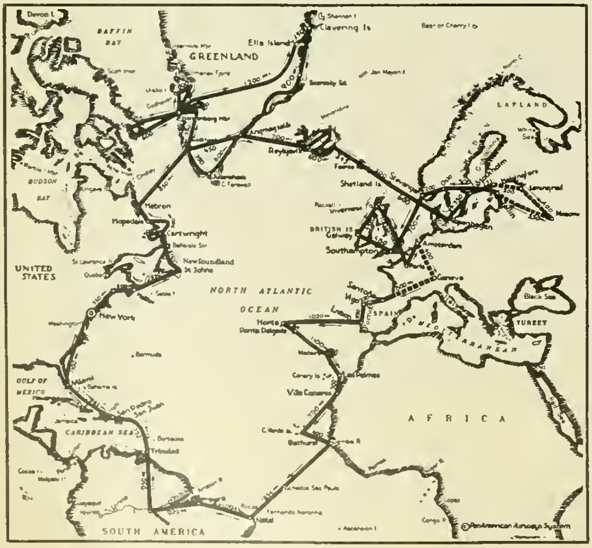
Lincoln Ellsworth sailed from Dunedin, N. Z., for the Antarctic regions. (Dec. 5)

Col. and Mrs. Lindbergh landed at Natal, Brazil from Africa in 15 hours 53 minutes. (Dec. 6)

Col. and Mrs. Lindbergh left Natal for the United States. (Dec. 8)

Rear Admiral Byrd sailed from Wellington, N. Z., with his second expedition to the Antarctic. (Dec. 12)

Col. and Mrs. Lindbergh completed 30,000 miles of flying when they landed at College Point, New York. (Dec. 12)



Route of the history-making flight covering 30,000 miles made by Col. and Mrs. Lindbergh to survey, for Pan American Airways, an ocean-route linking the United States and Europe

AIR

Hot and Otherwise

● After several years of apathy toward our National Defense, the Aeronautical Chamber of Commerce, in a brief issued by Leighton Rogers, at last expresses sentiments which the industry endorses and which AERO DIGEST has frequently voiced in these pages. It is most important that these ideas be given the widest possible publicity and having this end in view (and with all due modesty), I present herewith as *Air—Hot and Otherwise,* extracts from the brief in the hope that it will find sympathetic response on the part of our national legislators to whom—in this instance—it is directed.

● Aviation is an indispensable national institution. This business is vested with a public interest that transcends all considerations of private gain. Our companies are not built upon common industrial foundations. Our foundations lie deep in the national welfare. As manufacturers we invent, design and build a very intricate machine which is absolutely essential to our national defense. Since the World War some twenty Congressional and official committees have established incontrovertible proof of this.

The people of this country learned a bitter lesson as a result of our unpreparedness when the United States entered the World War. At the start of hostilities in Europe in 1914 some half-dozen small plants in the United States were building experimental airplanes. The following year the Allied Governments, unable to build enough planes, began placing orders here. When we entered the war in 1917 our plants had been expanded so that they were employing about 5,000 persons. They could have built about twenty-five hundred planes of a single type within a few months. Allied representatives arriving here to advise us soon convinced our Government that we must produce not 2,500 but 25,000 machines, perhaps more.

During the twenty-one months of our war effort, American plants produced for the Army alone 13,894 airplanes and 41,953 engines, with spare parts; also more than 2,000 planes for the Navy, and further, huge orders of manufactured parts which were shipped to Europe for assembly there.

Of those totals, the builders which could properly be classified as aviation companies, produced 9,742 planes and 14,765 engines. There were as many planes on the Western Front or on the docks here awaiting transportation abroad as the Central Powers had on the front lines at the end of the war.

●

FRANK A. TICHENOR

At the time of the armistice there were in the United States 24 aircraft and aircraft engine companies, with a total capitalization of twenty-three million dollars. They were geared up to produce 21,000 planes in twelve months, and they were actually turning out more planes than all the Allies combined. They employed as wage-earners 175,000 men and women, who were recognized, because of their value in this work, as being just as important as the men in uniform.

Within three months after the armistice the Government had canceled one hundred million dollars worth of war orders, the American aircraft business had been liquidated to within ten per cent of its war strength, and a great industry was faced with ruin and extermination. But the far-sighted leaders in the country recognized the potency of aircraft for commerce as well as war, and took steps to assure its peacetime development and application.

In 1923 the Lassiter Board, comprising able and impartial officers of the General Staff and other branches of the Army, reported to the Secretary of War that the aircraft industry was "entirely inadequate to meet peace and war requirements," and that "should a national emergency confront this country within the next few years, the air service would not be able to play its part in meeting it." Most important, these officers found that planes in sufficient quantities to meet war requirements could not be produced under the then present conditions until nearly two years after war had begun.

In December, 1925, A Select Committee of Inquiry into Operations of the United States Air Service for the House of Representatives, reported the result of the first comprehensive investigation by Congress as to reasons why the United States should rank third, fourth or fifth among the air powers of the world. That Committee, known as the Lampert Committee, found among other things that "the aviation industry is an essential part of the national defense and must be maintained."

In September, 1925, President Coolidge appointed a distinguished committee, headed by the late Senator Dwight W. Morrow, to conduct hearings and study the best means of developing and applying aircraft in national defense. The Morrow Committee found that the aircraft industry is not only an important part of the national defense but is also entitled to every encouragement that the Government can provide.

Congress definitely recognized the aircraft industry as a national institution when in 1926 it adopted the recommendations of the several investigating bodies, and passed the Air Commerce Act, the Navy Five-Year Aircraft Program Act and the Army Five-Year Aircraft Program Act.

The Air Commerce Act of 1926 was designed, in conjunction with policies of the Post Office Department, to lay the foundation of a great nation-wide civil aeronautics system. It was created to turn the airplane from war to peacetime uses. One of its aims was to bring into being a commercial air transport system for mail, express, and passengers to take its place among the already established transportation systems for the improvement of our national life and welfare. Its administration and the application of funds by the Post Office Department have been marked with such success that today we have in this country the most efficient, progressive, extensive and active air transport system in the world. Another purpose of the Air Commerce Act was to promote private flying, flying by individuals in their own airplanes. Despite obstacles and setbacks this has been accomplished to the point where there are now in the United States more private pilots and more private airplanes than in all the rest of the world put together.

That legislation, the Five-Year Aircraft Program, set up a policy calculated to maintain our air forces at an authorized strength, not capable of waging a successful war, but capable of being expanded into a successful war machine within a reasonable time after a declaration of war.

Again, Congress intended that besides giving us the skeleton of an air-force capable of being quickly and tremendously expanded in war emergencies, construction work of the nature of these five year programs would provide work for the group of factories, which, in conjunction with the commercial construction already mentioned, would be sufficient to keep those vital factories in business.

The Five-Year Program Acts authorized 1,800 serviceable airplanes for the Army and 1,000 serviceable airplanes for the Navy.

At no time has either the Army or

(*Continued on page* 61)

• EDITORIALS •

"In no war of the future will the United States be permitted to wait seven months before producing the number of planes required for service against an enemy. No enemy will let us wait that long. The next war will begin with an aerial battle, and it will end with that first battle, so far as the ultimate victory is concerned."—
COL. E. V. RICKENBACKER.

The Lindberghs' Achievement

● The latest aerial achievement of Colonel Charles A. Lindbergh, assisted by Mrs. Lindbergh, has been duly acclaimed by the American people. It is always satisfying to notice in the outpouring of popular approval for a Lindbergh flight, that due tribute is paid to the precision and care with which his aerial undertakings are executed.

Final appraisal of the real value to aeronautics of this remarkable intercontinental flight of nearly 30,000 miles by the Lindberghs must wait upon a greater assimilation by the flying fraternity as a whole of the practical lessons learned and the truths demonstrated under unique flying conditions. *"Slim says that he found out . . ."* is an introductory phrase that receives the profoundest attention by those fliers smart enough to profit from new lessons and newly discovered truths.

Pending, then, the time when these new "Lindbergh discoveries" shall be available to the industry as a whole, we must return to the quick and basic achievement of the most recent Lindbergh flight. It is the old and reliable achievement. It is that of spreading good will and of exhibiting to foreign countries and to the world in general the reliability of American air equipment and accessories. It is an old and frequent achievement of the Colonel's. It is still a supremely important one. We salute the Lindberghs for it.

A Good Job Well Done

● Several years ago AERO DIGEST had occasion to call attention to the deplorable condition into which many of the army air posts had fallen, and was successful in enlisting the services of Representative W. Frank James, then chairman of military affairs, in the cause of improvement. The vigorous and unceasing activity of Representative James has led to the successful initiation of this important program of building work.

At Mitchel Field, for example, attractive and substantial brick and concrete buildings gradually replaced the wartime fire traps which disgraced the premises. Recently the government appropriated $213,000 for completing the work—the construction of drains, concrete roads and paved aprons and runways. This is a part of the government's program to spend nearly $1,000,000 for construction work on aviation fields and posts throughout the country, a plan that is a source of satisfaction to everyone concerned.

Amendments to the Regulations

● Several changes of importance to private flying have been made in the Air Commerce Regulations of the Department of Commerce.

Major J. Carroll Cone, Assistant Director of Aeronautics in charge of air regulation, has been working for several months to find means of making the regulations more adaptable to the present needs of private flying. He has talked with pilots, potential pilots, representatives of flying schools, and aircraft manufacturers, aeronautic organizations and editors of trade papers to obtain their opinions on the changes in the regulations which were then proposed. AERO DIGEST was privileged to learn of the details of the proposed regulations and to have had the opportunity of discussing them with Major Cone. It is our belief that these changes will aid in stimulating greater activity in private flying and Major Cone is to be congratulated for his earnest and comprehensive research in connection with these changes.

Briefly the changes are as follows: Creation of an amateur pilot's license with a prerequisite of 25 hours solo flying time; establishment of new ratings for Department of Commerce approved flying schools to provide for the new grade of license; provision that physical examinations for renewals of amateur, and private pilot licenses may be taken from any accredited doctor of medicine acceptable to the Department of Commerce; and enlargement of the privileges of private and limited commercial pilots to the end that they may carry guests, executives or employes of companies employing them, and may demonstrate aircraft to prospective purchasers, if not for hire. The changes also set forth that student pilots are no longer permitted to make landings at airline terminals or airports where flying meets or air races are in progress unless they are based at such points, and they further provide that passengers may sit at controls of dual controlled aircraft if operated by a pilot licensed in the higher grades and if no passengers are carried for hire.

The Airplane Without a Country

● Another anniversary—the thirtieth of that supreme American achievement which was made at Kitty Hawk, N. C.—has come and gone. It is pleasant and satisfying to those working in the field of aeronautics that this birthday of our science is not being forgotten, but each year is being noted and commemorated by the press and by the public as a significant and unique American anniversary.

But it is even more satisfying to notice that the thirtieth year since the first successful heavier-than-air powered flight has been made the occasion of a renewal of the proposal to return the original Wright plane to its homeland and to the place where it properly belongs—the position of honor in the Smithsonian Institution. On this occasion, for the first time, the gesture to rectify a grievous wrong is made by those persons who were responsible for the sending of the great American relic to the Science Museum at Kensington, England. To admit a willingness to confess an error, as Dr. Abbott, of Smithsonian, is reported to be prepared to do, is indeed a noble act.

Great institutions such as Smithsonian are supposed never to err, and it is therefore not surprising that from its human directors we notice that with this recent noble gesture there is also an attendant self-apology, that, after all, labeling is not the important thing; that the important issue is the immediate return of the famous plane.

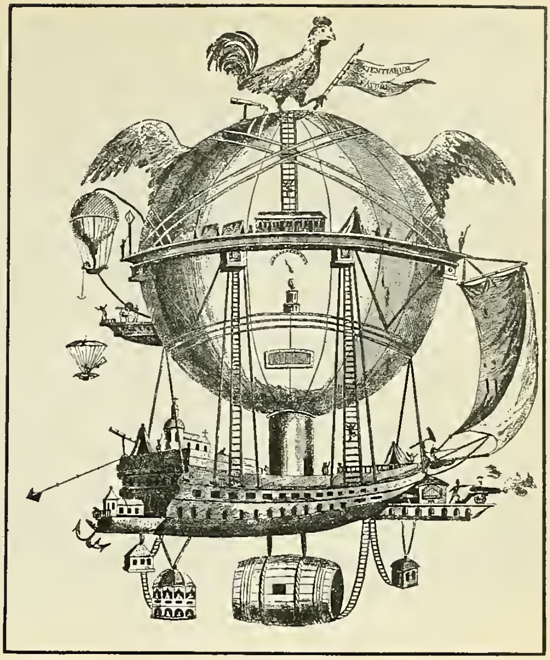
AERO DIGEST, as one of the pioneers against the injustice done to the Wrights, cannot subscribe *in toto* to such a philosophy. There is at hand at last an opportunity to make the issue a great and popular national cause. The particular virtue of such procedure is that every step of the triumphal return, up to and including the final placing and labeling, will be done in the bright light of the greatest national attention. Any other, hastily-executed, plan might result in an ignoble return, a hustling of the famous relic through the back doors and into oblivion.

We have waited long for the homecoming; we can wait a little longer, if the waiting means a proper and dignified return of this historic airplane to the country of its inception.

Philosophical Philadelphians

●

CY CALDWELL



Here is a French balloon of 1820, described as "almost a city" (no connection whatever with Philadelphia). Note the Pathe News Reel camera man on the balcony over the church

● It's about time that some kindly soul stepped out to rescue Philadelphia from its reputation as the world's dullest and deadest large town, a place where every citizen snores or goes to church on Sunday, or goes to church and snores. Even if nothing can be done for the Philadelphia of to-day, it at least may be pointed out that back in 1784 the old town was as skittish and advanced as the rest of them, and even sowed a few wild aeronautical oats. It was, in fact, the birthplace of American aviation. The first American to take the air was a Philadelphian; and the first aircraft was a balloon.

Why this fact has been lost sight of, I'm sure I don't know. Perhaps all that publicity about the Cradle of Liberty has drowned out everything else. But considering the small amount of liberty that the average citizen has left him to-day, it might be well for Philadelphia to find something to shout about that has grown greater, not less, with the passing years and advancing taxation. It would give the citizens of Philadelphia something to do on one of their deadly blue Sundays if they'd go in for early aeronautical research. I'll give them the start of it here, and they can go on and find out the rest of it, which I'd like to know myself.

As everyone knows, the first practical balloon was invented in France by Joseph Montgolfier, born 1740, died 1810. Quoting from the Encyclopaedia Britannica, "On June 5, 1783, at Annonay, near Lyons, in the presence of a considerable concourse of spectators, a linen globe of 105 feet in circumference was inflated over a fire fed with small bundles of chopped straw. When released it rapidly rose to a great height and descended, at the expiration of ten minutes, at the distance of about 1½ miles. This was the discovery of the balloon. On Sept. 19, 1783, Joseph Montgolfier repeated the experiment at Versailles, in the presence of the king, the queen, the court and an immense number of spectators. Suspended below the balloon, in a cage, had been placed a sheep, a cock, and a duck, which were thus the first aerial travelers. . . . The first human being who ascended in a balloon was Jean Pilatre de Rozier, a native of Metz. On Oct. 15, 1783, and following days, he made several ascents in a captive fire-balloon."

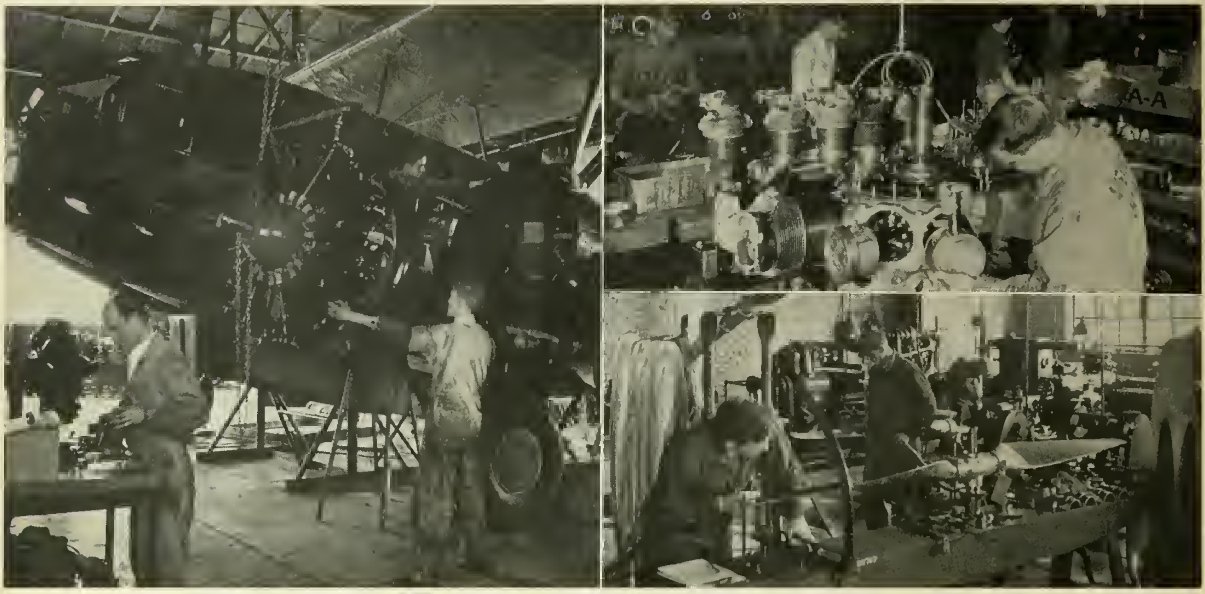
Still quoting from the Britannica: "Researches on the use of gas for inflating balloons seem to have been carried on at Philadelphia nearly simultaneously with the experiments of the Montgolfiers; and when the news of the latter reached Philadelphia, D. Rittenhouse and F. Hopkinson, members of the Philosophical Society at Philadelphia, constructed a machine consisting of 47 small hydrogen gas balloons attached to a car or cage. After several preliminary experiments, in which animals were let up to a certain height by a rope, one James Wilcox, was induced to enter the car for a small sum of money; the ropes were cut, and he remained in the air about ten minutes, and only then effected his descent by making incisions in a number of balloons, through fear of falling into the river he was approaching."

You will note the resemblance to modern practice: the pilot "was induced to enter the car for a small sum of money"; he still is. And these 47 small hydrogen balloons were the forerunners of the gas cells in a modern dirigible; thus the individual gas cell was a Philadelphia invention—which reached its highest development in the person of Smedley Butler.

I am indebted to Reader No. 6, Martin Norr of Elizabeth, N. J., for a copy of *The Pennsylvania Packet and General Advertiser,* of Thursday, July 29, 1784. Published every Tuesday, Thursday and Saturday. Price six-pence. It contains an article, AIR BALLOON, "To the Citizens of Philadelphia," and is signed by A. B. C., whoever he was—perhaps Air Balloon Critic.

"The gentlemen, who communicated their proposals to the public a few weeks ago, for constructing and raising a large, elegant Air Balloon, capable of raising great weights, and of carrying up men and other living animals into the regions of the atmosphere, and of returning them with safety to the earth, provided a sufficient sum of money should be subscribed to defray the expense, beg leave to declare that a liberality of spirit has been manifested to encourage the undertaking. Some occurrences, however, have happened, to give a temporary check to the proceedings. In particular, Mr. Carnes, a gentleman from Maryland, having advertised his intention to launch a Balloon into the air on Saturday last, the subscription was suspended till that exhibition should be over. As this was the private undertaking of an individual, who had been at great charge to gratify the public curiosity, he was thought deserving of encouragement. Every appearance of interfering with this laudable and spirited undertaking of a stranger, entitled to respect, was, on that account, carefully avoided. It is to be sincerely regretted that an experiment so worthy

(*Continued on page* 64)



Scenes in American Airways' new repair base showing aircraft, engine and propeller activities

Concentrating the Repair Base Facilities

● Ranking as one of the finest overhaul bases in the air transportation industry, a new and modern building has been completed at the Chicago Municipal Airport to enable concentration of all major repair and service work for the Eastern Division of American Airways.

Adjoining the south end of the company's hangar, the new building represents four months of construction work. To accommodate the base, it was necessary to build a repair depot building measuring 40 feet wide and 200 feet long, enlarge the office wing adjoining the east side of the hangar by adding a 60-foot extension to the second floor and alter a considerable space within the structure itself. The exterior beauty of the present hangar has been maintained in the new construction work by use of conforming face-brick and trim.

The company's aim to centralize all work under one roof is seen in the facilities provided to make possible every service operation from the cleaning of spark plugs to the reconditioning and overhaul of complete planes and engines. Specialization of departments is evident in the paint shop, engine overhaul shop, radio shop, instrument shop, sheet metal and welding shop and two engine testing rooms. In addition, there is a completely equipped hangar where the general work of major plane overhauling is done.

The new shops are equipped for the repair and reconditioning of airplanes of all sizes. Engine service and overhaul routine covers Wright Whirlwind and Cyclone engines, Pratt and Whitney Wasp and Hornet engines, and both 215- and 240-horsepower Lycomings.

Dope and Paint Shop

A dope and paint shop measuring 67 by 40 feet with a minimum ceiling clearance of 16 feet, and covered with a roof of solid concrete is at the extreme east end of the new structure. Completely segregated from the adjoining building units by 13-inch brick walls, this section can accommodate at least two large work projects at one time, while a large number of wing panels, tail groups, and smaller surfaces may be accommodated without crowding. Constant ventilation has been provided by a duct system, connected to a conoidal blower unit mounted on the roof and discharging into the open air above.

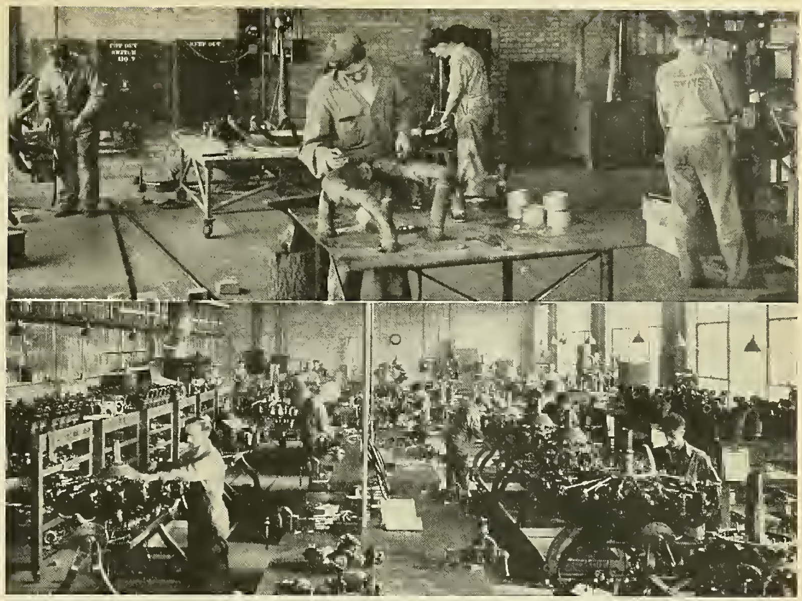
Occupying a unit 105 by 38 feet and adjoining the paint shop are the machine and engine shops where the entire engine overhaul work is handled. The engines enter through a door in the hangar wall near the east end, and move down a production line to the west end where they are tested in one of the two test chambers provided.

Each test chamber is 25 by 12 feet and follows ordinary practice in design, except that special effort has been made to reduce noise and vibration by the construction of floors of separate slabs of concrete, insulated from the main floors and walls by a two-inch mastic joint to eliminate transmission of vibrations.

The sheet metal department

Air intake for the test stands is at the west end of the chambers and vertical exhaust stacks extend six feet above the roof. The doors, between the test blocks and exhaust stacks, fit into recesses in the walls and when closed, permit heating of the chambers. When open, they allow free air flow from the engine to the stacks, enabling more satisfactory running-in conditions and engine adjustment.

The sound-proof doors connecting the test chambers with the engine shop proper are unique in design, having welded steel frames with a center core of Insulite which is separated from the parallel wooden door panels by a dead air space. Acoustical experiments have shown this to be one of the most effective methods of breaking up sound waves.



General views of the welding department and engine overhaul shop

Sound Proofing

Further noise eliminators are found in adjustable gaskets along the heads, jambs and sills of each door. The test instruments are mounted on panels facing each other across the alley-way separating the two chambers and the operator may observe the engines through wire glass windows in the doors leading from the engine shops.

To facilitate movement of engines from the wheeled assembly stands to the test stand uprights, an overhead, hand operated crane is provided. Two other overhead cranes, operating on tracks, run the full length of the overhaul production line, directly above the tracks on which the engine stands are moved. The major part of the machinery is localized to leave the floor clear for the general overhaul routine.

Work of overhauling wing panels, wood working, fabric, fairing, upholstery, and cabin interiors is done in the hangar proper where in the southeast corner are three rooms, housing the air compressors, the sand blast equipment, and the battery and plating departments. The latter two rooms are mechanically ventilated by special exhauster systems, while the two air compressors in the first room supply air wherever needed throughout the building.

A two-story stock room, 40 by 76 feet, is in the southwest corner of the main hangar section. Supplies are delivered over a new concrete drive to a door on the west side.

Parts and supplies to be stored on the second floor of the stock room are drawn up by a crane through a hatch in the floor, directly inside the first floor entrance. In the southeast corner of the stock room is a tool room with service windows leading to both the hangar and engine overhaul shop and a shop office with facilities for the foreman's records, inventory control, timekeeping, and similar office work, is situated on the upper level.

Fire Protection System

The main section of the hangar is protected against fire by a pre-action rate of rise deluge system, while the new shops are protected by a wet pipe system. Extinguisher pipes leading into the engine test rooms are filled with a special compound that will not freeze when engines are being tested under cold conditions.

The office building is on the east side of the hangar. The first floor has been arranged to accommodate radio and instrument repair, the sheet metal and welding departments and locker rooms with complete facilities for the mechanical personnel.

The second floor of the office building houses Eastern Division headquarters, including the offices of R. C. Marshall, vice-president of the division; Earl Ward, operations manager; J. P. Ruden, superintendent of line maintenance; H. D. Ingalls, superintendent of maintenance and overhaul, and other operations officials and their staffs.

General views of the instrument laboratory, the cleaning vats and the radio laboratory

Personairlities

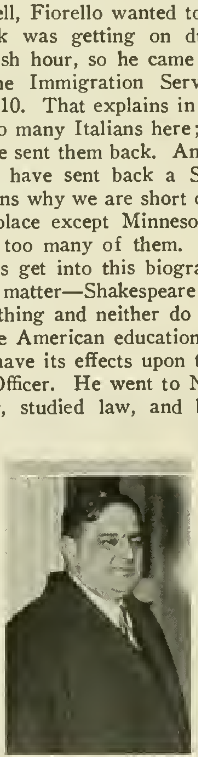
by Caldwell

● DELVING, as I usually do, among the biographical *flotsam* and *jetsam* of the humble piloting fraternity, it is but seldom that I lead my six patient readers into those sacred realms inhabited by Congressmen, Mayors, and the like. This month, I am happy to say, I have captured for biographical analysis a very rare specimen of our species—an honest politician. Now, don't be like the bumpkin at the circus, who looked at the giraffe and said, "There ain't no such animal." There *is* such a thing as an honest politician. After he is dead, we refer to him as a Statesman. Lincoln, for instance lived as a politician, died a Statesman; Hiram Bingham started hoping to be a Statesman, became a politician, slipped at that, and fell to the depths of being simply Hiram Bingham. So it goes.

The victim we are putting on our operating table this fine winter morning is no less a personage than the Mayor of the City of New York. He got off to a bad start in life by being a lawyer and a Congressman, but gradually he lived it down. Then a group of Tammany gentry whom Ali Baba would have recognized instantly, got hold of New York, nearly ruined it, and thus paved the way for the election of anyone whom the people suspected was honest. And behold, brethren, at the moment of their discontent there appeared one Fiorello H. La Guardia, former Congressman, whom no one had ever caught taking anything. Upon which they said, one to another, "What manner of man is this? Surely an honest Congressman is a *rara avis,* a rare bird. Let us elect him as Mayor." And they did. And that's that. He's one of the few pilots who ever got anywhere.

Fiorello La Guardia was born in New York City Dec. 11, 1882, an unlucky day in the lives of two gents named O'Brien and McKee, though they didn't realize it until they ran against him for Mayor last year. Much of young Fiorello's childhood was spent in Army posts in Arizona and the Dakotas. His father was an Army bandmaster, and it was in this school that Fiorello learned to toot his own horn, an invaluable bit of knowledge to one contemplating politics as a career. At an early age he decided that anyone who wanted to live well should hold some kind of public office, so he entered the consular service of the United States, and was stationed in Austria-Hungary from 1902 to 1906. At about that time we were getting a lot of immigrants whom nobody could understand. They would land at Ellis Island, remark, "Spaghetti, macaroni, hava-banana," and then leave it it up to some Yankee from Vermont to translate. He was always sunk. Then somebody suggested that perhaps these people were Italians, and that Fiorello La Guardia could understand them. So what did the Government do but write him asking "Do you want to enter the Immigration Service?" Well, Fiorello wanted to see how New York was getting on during the subway rush hour, so he came back and was in the Immigration Service from 1907 to 1910. That explains in part why we have so many Italians here; a Swede would have sent them back. And an Italian would have sent back a Swede; so that explains why we are short of Swedes in every place except Minnesota, where they have too many of them. How did the Swedes get into this biography anyhow? No matter—Shakespeare never rewrote anything and neither do I.

Soon the American educational system began to have its effects upon the young Customs Officer. He went to New York University, studied law, and before he could be stopped was admitted to the bar. After this there was nothing he could do but go in for politics as a career. In 1915 he became Deputy Attorney General for New York State, one of our largest and most licentious states, an object of horror to a sanctified State like South Carolina, for instance.



Mayor La Guardia

In 1916 the Republican La Guardia ran for Congress; I don't like to speak ill of any man, but he has been elected to the 65th, 66th, was let off the 67th, (for good behavior) and was forced to serve in the 68th to the 72nd Congress. In between he was elected president of the Board of Aldermen of New York City. In 1929 he ran for Mayor against Jimmy Walker, but lost, as at that time Seabury had not investigated Walker. All La Guardia did was to sit down and wait until we learned more about Tammany Hall, Jim Farley, Curry, McKee, and other political growths.

But let's stop talking about his political career, for after all the man has his better side. Just because he's been a Congressman and is now the Mayor of New York is no reason why I should heartlessly broadcast it; after all, he may be sensitive about these things. I wouldn't mention it, only I aim to tell the whole bitter truth about everyone. I'll only add that as a Congressman he was respected and trusted, which is an odd condition, you'll admit. Whenever anyone referred to him as a Congressman, someone else always spoke up and said, "Yes, but he's an honest man."

It was back in 1915 that La Guardia took up flying. But being a smart man he only stuck with it through the war and then went back to politics. He was in Congress when the matter of war was brought up, and being at heart a good fighter, he voted aye, packed up his Congressional immunity, chucked it in a nearby waste-basket, and went to the war as a pilot. His first flying had been out on Long Island at what is now Roosevelt Field with Guiseppe Bellanca, whose biography appeared here recently. It was natural that he should go in for aviation; he has short legs and would have difficulty keeping up with the infantry on a route march; and he never liked walking anyhow. So in due course he bobbed up with a Lieutenant's commission, was appointed to the Staff be-

(Continued on following page)

AS OF NOVEMBER 30TH, 1933,

EIGHTY-NINE HAMILTON STANDARD CONTROLLABLES

ON UNITED AIR LINES' ROUTES HAD FLOWN A TOTAL OF

45,206 HOURS, 32 MINUTES

These Wasp Controllables, even with winter schedules, are increasing their hours at the rate of 14,516 a month.

One of these Controllables had accumulated 1,006 hours and 2 minutes of flight service. Another had 248 hours in one month—an average of eight hours per day for thirty-one days.

Twenty-two of United Air Lines' Controllables had over 750 flight hours each. Fifty-one had over 500 hours each.

All of these flight hours were accumulated under continual operation at 75% of full power, or an actual power input of 410 h.p. at 2,000 r.p.m., except that during take-off and initial climb the actual power input was approximately 550 h.p. at 2,200 r.p.m.

Today all regular scheduled flights, totaling 34,632 miles daily, on United's transcontinental New York to San Francisco route are flown with Boeing 247's equipped with Hamilton Standard Controllable Pitch Propellers. With the completion of current deliveries of 35 additional Controllables these propellers will be standard equipment on all Boeing transports.

The significance of these figures will be apparent to the aeronautical industry. They represent the first successful use of Controllable Pitch Propellers on a large scale over an extended period.

HAMILTON STANDARD

CONTROLLABLE PITCH PROPELLERS

(Continued from preceding page)

cause the Army naturally figured that a Congressman wouldn't be much good for anything requiring more intelligence than Staff work.

Highly insulted, Lieut. La Guardia reminded them that he had gone into this thing to do some fighting, not to sit around drinking as a Staff Officer, so they shipped him to Italy. He flew as commander of the American detachment of bombers on the Italian front, was decorated with the Croix de Guerre (Italy), made a Knight Commander of the Crown of Italy, and shipped back with thanks, express collect, when the war ended. During his term of duty he did day and night bombing, and was made a Major.

You know, I've often maintained that if the Kings, Presidents, Kaisers, Senators, Congressmen, members of Parliament, Dictators, and other rulers had to fight in the wars that they started, we wouldn't have any wars. Well, that wouldn't hold if all of those in power were like Fiorello La Guardia; he'd vote for a war if he had a chance of fighting in it. And if the boys start a good war while he's Mayor of New York, then New York is going to be short one mayor soon after hostilities commence. At 51 you might think he was a little ancient for warfare, but La Guardia wouldn't agree with you. Incidentally, he doesn't look a day over 40 and has all the pep of 25. He is a member of the American Legion, Aviators' Post, a Quiet Birdman, and an honorary member of the Air Line Pilots Association.

He flies frequently on the air lines and recently made a trip from Panama to New York on the Pan-American and Eastern Air lines. In fact, he always travels by air whenever possible.

As Mayor of New York, Major La Guardia will find that the job of fighting hopeful politicians off the public payroll will prove so arduous that often he will look back on the war as a vacation.

* * *

● YOU MAY have seen Joe Crane descending here and there at air meets and at Roosevelt Field, Long Island, every Sunday, attached to a parachute, and you may have wondered how he got that way.

He was born at Carlinville, Ill., Feb. 23, 1902, and was known as the toughest baby in those parts. His nurse, an amiable old lady handicapped occasionally by mild attacks of gin jitters, used to drop Joe on an average of twice a week; but she used to remark apologetically to Mrs. Crane, "It's a amiable weakness, moddom, an' I doesn't do it a'purpose. Lor' bless you! I used to drop my own infants reg'lar, an' they're none the worse for it!" As it turned out, this early training proved invaluable to Joe Crane in later years, for after dropping on bathroom floors as a child he could drop from unmeasured heights without disturbing the even tenor of his way, although he frequently broke out in black and blue marks which added a piquant and intriguing uniqueness to his peculiar brand of manly beauty. In fact, after one especially hard landing, his friends, upon observing Joe in a shower bath, were laying bets as to whether the blue spaces on the after end of him was a tattooed picture of the Indian Ocean or the Black Sea. That question is still unsettled.

On Feb. 23, 1920, at the age of eighteen, he joined the U. S. Army, remained at Kelly Field until July, 1921, and then was transferred to Ellington Field, Houston, Tex. He was attached to Selfridge Field from then until 1924, being detached from October, 1922, to the following April, to attend the Parachute School at Chanute Field, Rantoul, Ill. It was here that he learned to jump. And the next year he jumped out of the Army to engage in commercial work.

Joe Crane

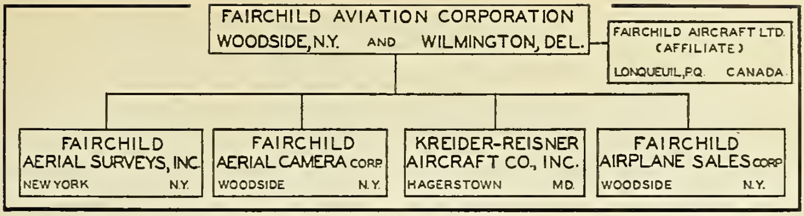
From 1924 to 1925 he engaged in steeple-jack contracting. This is one of the boldest of occupations and is not to be recommended to nervous apprentices. In that year he had three close calls. He bid on a flag-pole job which two other steeple-jacks beat him to—only to have their scaffolding and the pole collapse and have one of them killed, the other injured. On another occasion he was crawling around the rim of a high smoke-stack when his supporting rope burned away. He saved himself by clinging to the edge of the stack and crawling to safety. He was on another smoke-stack when something gave way and he saved himself only by taking Peruna. In short, it was a hell of a life for anyone who wanted to live to a ripe old age.

As the odds were ten to one that a steeple-jack would sooner or later come in for a long drop, Joe decided to equip himself with a parachute and make it a real drop from an airplane. So he gave up steeple-jacking without ever having painted a steeple, for all of his contracts had been for work on smoke-stacks, flag-poles and parts of high buildings. For the next five years he jumped and serviced parachutes in Detroit until 1930, when he became parachute instructor, jumper, and rigger for Roosevelt Field, Inc. He is one of the foremost exhibition jumpers in the country and can come as close to the mark as—well, I'm not going to get myself involved in an argument about who's the best parachute jumper in the United States; among the civilian jumpers it probably rests between Joe Crane, Roger Don Rae, and Jerry Wessling. As to Army and Navy parachute specialists, I have no information about them.

In competitions at the National Air Races at Cleveland in 1929, he placed first, making four first places out of a possible seven. At Kansas City, out of six jumps, he placed five firsts and one second. At Chicago in 1930 he won second money, and second money at Cleveland the following year. In 1932 he won first money at Cleveland, and in 1933 won first money at the American Air Races, Chicago.

Joe is now slightly over six feet tall, having stretched about four inches in the last three years, to the surprise and consternation of the medical fraternity. It happens that he has a large and rather heavy pair of feet; and every time the parachute snaps open and his drop is checked, the weight of his feet tends to stretch him out. Thus he owes the last four inches of his growth to parachute jumping and size twelve shoes. When this fact becomes more widely known, rotund celebrities like Frank McKay, Jerry McClelland, and Kate Smith undoubtedly will take up jumping to reduce their girth by adding to their length. In fact, parachute jumping is about the best weight reducer known. Did you ever hear of a fat parachute jumper? Even if he was fat to begin with, the profession usually starves him down to skeletal proportions.

At the Charity Air Pageant at Roosevelt Field last Fall, Joe Crane was placed by the management in charge of 46 parachute jumpers. Now, among them were jumpers who weren't allowed to fold their own chutes, because obviously they knew nothing about the matter. Such a condition should not exist to-day, and the safety of jumpers should not be left up to the personal responsibility of one man. It should be covered by parachute licensing requirements, just as pilots are licensed now. After all, a parachute is an aircraft, a device for gliding downward through the air. Why shouldn't the operator be licensed? Certainly if he is to do exhibition jumping, he should hold a federal license testifying to his fitness for the work. Then when he lands in the grand stands at an air meet he will be able to display his license showing that he holds authority to alight with his feet in your face.


FAIRCHILD AVIATION CORPORATION
WOODSIDE, N.Y. AND WILMINGTON, DEL.
FAIRCHILD AIRCRAFT LTD. (AFFILIATE)
LONQUEUIL, P.Q. CANADA
FAIRCHILD AERIAL SURVEYS, INC.
NEW YORK N.Y.
FAIRCHILD AERIAL CAMERA CORP.
WOODSIDE N.Y.
KREIDER-REISNER AIRCRAFT CO., INC.
HAGERSTOWN MD.
FAIRCHILD AIRPLANE SALES CORP.
WOODSIDE N.Y.

The Fairchild Aviation Corporation

ITS HISTORICAL DEVELOPMENT, SCOPE OF ACTIVITIES AND EXECUTIVE PERSONNEL

● The history of the Fairchild Aviation Corporation divides itself into three distinct periods: the first, from 1920 to 1929, was one of rapid expansion under the management of the founder of the company, Sherman M. Fairchild. The second, from 1929 to 1931, was as the manufacturing subsidiary of The Aviation Corporation, while the present began in 1930, when Fairchild re-purchased control from The Aviation Corporation and operated the Fairchild Aviation Corporation as an independent company, with the same management and policies as were in effect during the first expansion period.

The Fairchild Aviation Corp. is the outgrowth of a company which was originally formed in February, 1920, to manufacture automatic aerial cameras, under the name of Fairchild Aerial Camera Corp. Expansion followed in rapid and logical sequence, and in 1921 the Fairchild Aerial Surveys was formed. Fairchild then began operations in Canada in 1922 with a company known as Fairchild Aerial Surveys of Canada, which name was later changed to Fairchild Aircraft, Ltd. Expansion continued with the formation of the Fairchild Airplane Manufacturing Corp. and Fairchild Engine Corp. in 1925, while in 1929 control was obtained of the Kreider-Reisner Aircraft Company. All of these corporations were controlled through Fairchild Aviation Corp., a Delaware company.

Sherman M. Fairchild

During this period Fairchild contacts throughout the aviation world brought opportunities in many fields other than manufacturing. The Fairchild Aviation Company, George Rhiel and certain Mexican interests owned Mexicana de Avacion, which was later sold to Pan American Airways and became the basis of their Mexican division. Sherman Fairchild and his associates were the controlling factors in the West Indian Aerial Express, Inc., which owned the first operating company in the West Indies, and whose assets were also merged with P.A.A.

Opportunities crowded in from every side. To take advantage of these opportunities, directors and bankers of the Fairchild Aviation Corporation formulated plans which were culminated on March 1, 1929, with the formation of The Aviation Corporation. Sherman Fairchild became vice-president of The Aviation Corporation, but control of the new company was vested in the group that furnished the new capital.

The Aviation Corporation purchased 150,000 shares of the common stock of Fairchild Aviation Corporation and with enough additional stock acquired from stockholders, obtained control of Fairchild Aviation Corporation. This transaction, involving the formation of The Aviation Corporation and passing control of Fairchild Aviation Corporation from the group which had guided it for the previous ten years, had on the face of it all the elements of success. Two factors, however, had not been reckoned with—the depression of 1930 and the differences of opinion as to the management policy between the minority and the majority stockholders.

THIS IS THE SECOND OF A SERIES OF FEATURE ARTICLES RELATING TO THE MAJOR AERONAUTICAL ORGANIZATIONS OF THE UNITED STATES

It became impossible to compromise on these differences of opinion in any way satisfactory to both majority and minority stockholders. Therefore Sherman Fairchild proposed that The Aviation Corporation buy the Farmingdale plant of the Fairchild Aviation Corp., and other miscellaneous assets, for $1,262,000, and that this amount be used to buy back the Aviation Corporation's shares of Fairchild stock. The Aviation Corporation then released any right in the name of Fairchild and in the good-will accruing to the operations of the company.

This proposal was accepted and effected on April 1, 1931, leaving the Fairchild Aviation Corp. again an independent corporation. It had, as before, four divisions: First, the manufacture of aerial cameras by the Fairchild Aerial Camera Corp. Second, aerial surveying by the Fairchild Aerial Surveys. Third, airplane manufacturing concentrated in one plant in the U. S. at Hagerstown, Md., instead of at both Hagerstown and Farmingdale. This activity, including the manufacture of the Model 71, was under the airplane manufacturing subsidiary, Kreider-Reisner Aircraft Co., Inc. The fourth division, a Canadian manufacturing plant, was operated by Fairchild Aircraft Limited. Since 1931, Fairchild has not manufactured any engines.

Today, the Fairchild Aviation Corp. stands with an enviable record of pioneering achievement. It was born in the days when commercial aviation was an

Ernest Robinson

W. H. Schwebel

L. E. Reisner

E. R. Polley

F. W. Lutz

unknown thing in this country, grew up through the lean years of the pre-Lindbergh era, reached young maturity in 1929 when its cabin monoplanes were the original equipment for air transport operations throughout North and South America, and when it made the still unchallenged record of selling three and a half million dollars worth of commercial airplanes. And now, once more under the control of the same group that fostered the infant company, it stands a pioneer that after a long trek has already staked his claim, and loaded his guns with years of experience in the business and an outstanding line of products. It is worthy of mention that the executives of both Fairchild Aviation Corp., and its subsidiaries have been associated with the company for nine years or more and that 50 per cent of the employes now working in the organization have been there for at least five years. These executives are Sherman M. Fairchild, president, who originally formed the company; Ernest Robinson, vice-president, who became associated at the inception of the organization and W. H. Schwebel, secretary and treasurer, who came with the company early in 1925.

Most corporations do not exist in their present form because they were originally organized in that form, but usually start from some incident, often not closely related to their present business. Such is the case of the Fairchild Aviation Corporation. Amateur photography had always been the hobby of Sherman M. Fairchild, not so much the taking of pictures, as the mechanics of the cameras with which they were taken. It was only natural, therefore, that he should know the faults of the war-time cameras and that he should be working on ways of overcoming those faults. Most of the war-time cameras were adaptations of various types of ground cameras, with a fixed, instead of a leather bellows. Fairchild visualized an entirely new and different type of aerial camera, one which would produce distortionless pictures which could be used as the basis of accurate measurements, and which would be accurate, fool-proof, and entirely automatic. Fairchild presented his visualization of this camera to Washington. Washington was interested, but not ready to contract for such a radical instrument. They did, however, ask him to design a film spacing mechanism for their existing cameras. It worked, and based on this success, a government order was obtained for one of his shutters to be placed on an existing camera. Later, one of his new fully-automatic cameras was purchased. This original camera has been improved and refined in the last 13 years, but today has the same functions and basic mechanisms. At present, more than 15 types of cameras are made and their use has spread to 16 countries.

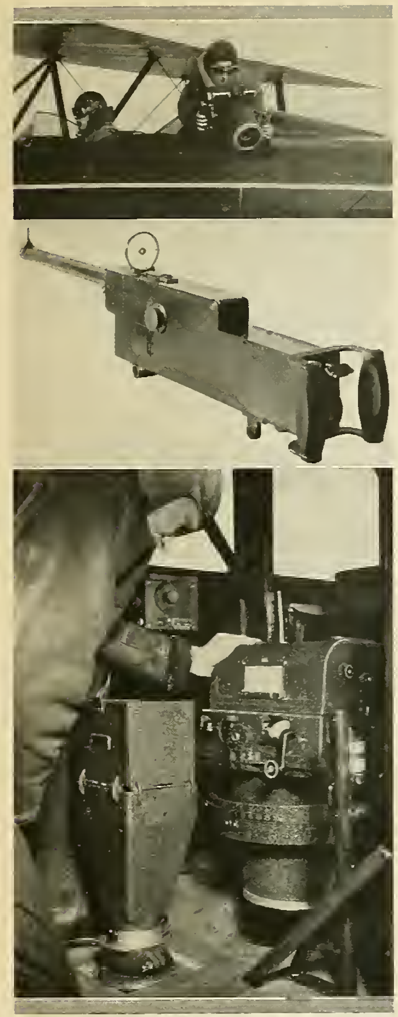
If the Government could use the automatic cameras to make maps, why could not the civil engineering profession use them? But to the engineering profession, aerial photographs were not surveys, only pictures. An entirely new technique had to be developed for accurately putting these photographs together to obtain a usable map. Fairchild Aerial Surveys pioneered not only most of the methods and processes of accurately placing the photographs to make a photographic survey as differentiated from an inaccurate assemblage of photographs known as a mosaic, but also pioneered most of the applications of photography to various industries.

At first the planes rented for this aerial survey work were found satisfactory for this exacting work. One of the first Fokkers in this country was purchased, and then, still looking for a suitable ship, Fairchild commissioned Huff Daland to build two special planes for photography. Subsequently, Fairchild had Sikorsky build a photographic plane for Brazil, the latter's first American order. However, all these planes were adaptations of war planes and far from the ideal photographic plane. The Fairchild executives thought that the pilot should sit forward and be provided with excellent visibility, that the photographer should work in a comfortable, heated cabin, that the wings should fold, and that the plane should have brakes and flaps, and that the stabilizer should be automatically adjusted to take care of change in the balance caused by depressing the flaps. These ideas were submitted to several companies who said that they would build such a plane if Fairchild insisted on it, but at a price so high that the latter was forced to go into the airplane manufacturing business himself. Accordingly, he purchased the plant of Lawrence Sperry, and there the Fairchild made its debut as the first cabin monoplane with the pilot forward and inside. After flying in the 1926 Ford tour with an OX motor, it subsequently had more power added and was developed into the famous line of Fairchild cabin monoplanes, including the well known FC-2 and 71, both of which have seen service in all parts of the world.

Every move of the Fairchild organization has been characterized by thoroughness of engineering and precision of manufacture. Only this year Pan American Airways ordered four Fairchild 71s, convincing proof that even five years after its development, this ship is outstanding in ruggedness for operations in isolated territories.

Fairchild's manufacturing activities rapidly expanded and in 1928 a new factory and flying field were built at Farmingdale. Fairchild acquired control of Kreider-Reisner and built for them a new plant at Hagerstown, at present the only American airplane plant of Fairchild Aviation Corp. A low-wing, small commercial plane, developed in 1920, was the forerunner of the present trend to low-wing monoplanes, but it never was marketed, since at that time it was impossible to solve the problems of buffeting and stability characteristics in low-wing airplanes to Fairchild's satisfaction.

At that time no reliable engines had been developed to replace the war-time engines which were still used to power all small ships. To obtain greatly increased reliability, light weight, combined with low cost of maintenance, Fairchild arranged to take over a cam engine which was being developed by Caminez for the U. S. Army at Wright Field, and A. T. C. No. 1 was obtained on this engine. Since the four-cylinder model proved to be too rough and the eight-cylinder model was never placed in production, engine activities turned from Cam to in-line engines. As a result, six and 12 in-line, air-cooled models, which even today are the latest development in air-cooled, in-line powerplants, were placed on the market. These designs, however, represented the chief asset that The Aviation Corporation retained when Fairchild severed his connection with the holding company.



Taking obliques with the F-8; the CG16 machine gun camera and the fully automatic K-3B in action for verticals

FAIRCHILD AERIAL CAMERA CORPORATION

The Fairchild Aerial Camera Corporation was organized in 1920 a number of years after Sherman M. Fairchild conceived modern aerial photography with the introduction of revolutionary principles in the design and construction of aerial cameras. By a single courageous step, departing from accepted practice, under the stimulus of war, Fairchild eclipsed the progress made by a slow evolution in aerial camera design that had started with the mere adoption of ordinary camera types and had been progressing for a number of years.

Existing aerial cameras employed wood in their construction and were not dependably accurate in performance. But Fairchild took advantage of modern light metals to gain ruggedness and attained scientific accuracy by simplifying design and by precision manufacturing processes. Such devices as the winding crank which automatically disengages itself when the camera is fully wound and the shutter which automatically releases only when the camera is properly wound, eliminate uncertainties both of mechanical inaccuracy and human fallibility.

Another of Fairchild's basic principles called for standardization and perfect interchangeability of all parts. Scientific accuracy and interchangeability of parts had been declared incompatible. Accuracy had always been associated only with expert individual fitting and adjustment. Yet, by employing precision methods in the manufacture of all parts, Fairchild showed that accurate aerial cameras could be made from assemblies of standard units and parts.

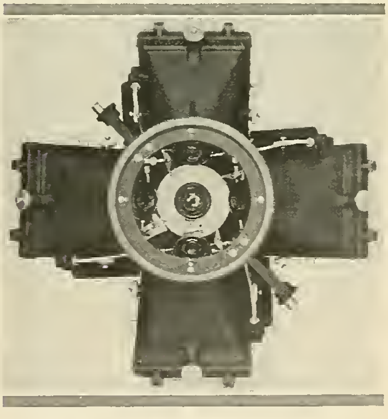
A third principle which Fairchild advanced was the use of a shutter to obviate distortion and overcome other difficulties. This type of shutter was generally considered impractical because it opened and closed so slowly that the opening was partially obstructed during most of the period of exposure. But Fairchild designed the between-the-lens shutter that opens so rapidly that less than one-thousandth of a second is required to clear and again to close the opening, resulting in a great efficiency.

In addition to the advantages of pioneering the modern aerial camera, the Fairchild Camera corporation had the advantage of constant cooperation in the improvement of design, construction and material by the Materiel Division of the U. S. Army Air Corps, the Bureau of Aeronautics of the U. S. Navy, the Department of Civil Government Air Operations and the Department of National Defense of Canada as well as the military organization of other governments. Invaluable, too, was the practical experience through association with the Fairchild Aerial Surveys, Inc.

Until 1927 most of the company's business came from the governments of the United States and foreign countries. In March of 1929, however, a Fairchild aerial camera especially constructed for commercial use was placed on the market. No other aerial cameras have had to meet such a wide range of requirements, have so many varied achievements to their credit—military, commercial, exploration and aerial mapping of uncharted areas. Fairchild cameras were used in the gigantic task of mapping the Dominion of Canada from the air, using both vertical aerial photographs and a new oblique system of mapping; by the U. S. Navy to map Southeastern Alaska and Porto Rico; by the U. S. Army Air Corps and the U. S. Geological Survey working together to map uncharted, inaccessible areas of the United States and by Rear Admiral Byrd in mapping his flight to the South Pole. Fairchild aerial cameras were used in such notable expeditions and explorations as the Shippee-Johnson Expedition into Peru, the University of Pennsylvania expedition into Yucatan (Central America), the Wilken's North Polar Expedition and the Hamilton-Rice Expedition into the tropical Amazon region. Fairchild cameras have photographed Mt. Shasta from a distance of 332 miles; Dayton, Ohio, from an altitude of 37,556 feet and Washington, D. C., at night, by Captain A. W. Stevens of the U. S. Army Air Corps and have been used by the air services of such nations as Czechoslovakia, Poland, Russia, Japan, Mexico, Peru, Argentina, Colombia and Brazil.

Fairchild is the only organization exclusively devoted to the development and manufacture of aerial cameras and accessories. It is thus enabled to specialize to a much higher degree in order that extensive research and constant improvement of design may be carried out with maximum efficiency. This specialization or departmental grouping of experts in different fields is typified in such divisions of the organization as the Fairchild Scientific and Research Bureau, the Engineering Division where ideas for improvements are developed, the Model Development Department for experimental construction, the Factory Planning Department and the Optical Laboratory and other laboratories and inspection departments.

It is therefore not surprising that credit should go to the company for the development of such revolutionary machines as the TA-3, a five-lens aerial camera described in the June, 1933, issue of AERO DIGEST; the K-3B, basic camera of the U. S. Army Air Corps, and adaptable for taking overlapping vertical photos or use as a hand-held camera for taking oblique pictures; the K-8 and the F-8 the latter being designed primarily as a hand-held aerial camera. The latest Fairchild develop-



Underside of the five-lens camera

Aerial view of Woodside, N. Y., offices

ment, the Type CG16 camera machine gun for military training, is designed to replace either fixed or movable machine guns in order to give pilots and observers training in aerial machine gunnery. It resembles an aircraft machine gun very closely in outward appearance and in the nature of the controls and adjustments that the pilot has to handle. Using a 16 mm. film in cartridges or magazines which can be loaded into the gun as simply as a clip of cartridges slides into an automatic pistol, it represents a great contrast with the crude and constantly-jamming camera guns of the war period. The Fairchild company also produces a recording instrument for reproducing sound on an aluminum disc which can immediately be played back without in any way processing the record. It is largely used by schools and universities in connection with speech correction, public speaking, language and music departments and speech clinics, and is also used by studios for commercial recordings and radio stations. A sound laboratory for the further development and experimental research of sound recording and reproduction is also maintained.

The Fairchild Aerial Camera Corporation is not merely a manufacturing organization. It is as much an institution of research, development and service as it is a manufacturing unit, and is guided by men who have a keen conception of the problems they face. They are Ernest Robinson, president; W. H. Schwebel, secretary-treasurer and F. W. Lutz, vice-president who, like the others, has a long and illustrious record with the organization.

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FAIRCHILD AERIAL SURVEYS, INC.

On August 16, 1924, the Fairchild Aerial Surveys, Inc., was organized to take over and handle all the photographic and surveying operations of the Fairchild Aerial Camera Corporation and early in its existence distinguished itself by completing an aerial photographic map of Greater New York. The work entailed the taking of some 620 square miles of area from the air. When finished the map was delivered at a scale of 600 feet to the inch and consisted, in addition to a wall map of some eight square feet, of some 140 sections, each sheet portraying the city in minute detail, showing every structure, existing streets and boulevards, as well as unrecorded foot-paths and trails through the parks.

By 1925, aerial photography was definitely accepted by civilian engineers and government experts as an accurate, scientific method of making surveys, and as a result new technical developments and applications of aerial photography followed each other in rapid succession. Soon there arose an increasing demand for aerial photographic maps covering large areas, including complete cities and in some instances complete countries.

Further encouraging reports were made by commercial operators of the photographing, mapping and surveying work done in 1927. Fairchild that year flew 1,000 hours and covered 5,000 square miles surveying the Missouri River for the War Department, sections of Massachusetts, Erie County (N. Y.) and Trenton, N. J.

Following the opening of branches in Dallas, Texas and Los Angeles, the Fairchild company increased the number of hours it was flying and extended the sizes of the areas it mapped. Its work expanded so that while it made surveys primarily for utility companies, railroads, lumber concerns and cities, it also mapped several thousand square miles for the United States Corps of Engineers in connection with flood control projects.

In 1930, the company developed a new focusing camera to take close-ups of other airplanes in the air and with new additions brought its library of oblique photographs to more than 60,000 views, including most of the leading cities throughout the world.

Oil companies prospecting for favorable geological formations became aerial survey converts in 1931 and together with the others who were using this type of work, were responsible for requiring the company to fly, 1,500 hours.

In May, 1931, the company acquired the capital stock of the Aerotopograph Corporation of America, and secured exclusive rights in the United States, Canada and Mexico to patents of the Zeiss-Aerotopograph of Jena, Germany—processes covering a new method of producing accurate topographical maps from aerial and terrestrial photographs. Included in the large photographic projects the company has accomplished is the Boulder Dam job. Only recently, Fairchild received a government contract to map 24,500 square miles of the Navajo and Zuni Indian reservations in the Southwest to aid the Soil Erosion Service in its work of checking erosion on land which has been progressively impoverished and destroyed by erosion which followed over-grazing.

The executive personnel of the Fairchild Aerial Surveys, Inc., includes Sherman M. Fairchild, president; Ernest Robinson, vice-president, and W. H. Schwebel, secretary-treasurer. E. R. Polley is vice-president in charge of the Los Angeles branch.

●

KREIDER - REISNER AIRCRAFT CO., INC.

One of the pioneer fixed base operators in the East was L. E. Reisner, who in 1920 formed the Reisner Aircraft Service Company at Hagerstown, Md., which was destined to become the forerunner of the present Kreider-Reisner Aircraft Company, Inc. Although the company, as distributor for a number of manufacturers, had varied success in marketing airplanes it designed and built a series of ships particularly suited for racing purposes. An earlier association with A. H. Kreider resulted, late in 1925, in the formation of the Kreider-Reisner Company, but its business of selling, repairing and rebuilding other peoples' planes did not occupy it for long.

Armed with the plans for a light plane, the company built a racer for entry in the events to be held at the Philadelphia Sesquicentennial Exposition. It was powered by a Wright-Morehouse 2 cylinder 29 h.p. engine and when fully loaded weighed 490 pounds; its empty weight was 289 pounds.

Completed only a day before the races and test flown on the following morning, it took off on its second flight as a competing ship in the race for the Scientific American trophy. It not only won this event, but also another race in which Reisner, dropping out because of the loss of the nose spinner, rejoined the racers and, although a lap behind, came on to win.

Spurred to greater efforts by its success in the Philadelphia races, the company determined to secure a plane to compete in the reliability tour of 1927. Finding no manufacturer who would incorporate its new ideas in a plane, Kreider-Reisner built it themselves. So began the production of Kreider-Reisner aircraft.

From its original 330 square feet, the factory space at the Hagerstown plant steadily increased until today it approximates 90,000 square feet, the additional space being furnished in a new and modern structure of the Monitor type. In

FAIRCHILD *acknowledges*—

FAIRCHILD acknowledges that it has a four-fold responsibility to owners . . . to design progressively . . . to build faithfully . . . to sell honestly . . . and to service sincerely. Adherence to such ideals has enabled Fairchild . . . through the years . . . to gain for its products a good-will which it prizes highly. It has likewise made possible the development of two of the country's finest airplanes—the Fairchild 22 and the Fairchild 24.

Every pilot wants the best plane his money will buy. Good looks and performance . . . economy . . . and the ability to stand up. True, you expect the finest materials in your plane, but you get something more important in a Fairchild . . . the way those materials are put together. In every Fairchild Model you get style . . . fresh design . . . good "looks." > > > You get performance . . . so that every flight will be a thrilling adventure. > > > And you obtain comfort . . . safety and economy. Consider all these items and you will agree that what you buy in every Fairchild plane is modern ENGINEERING BRAINS.

The Fairchild 22 is a leader. In skilled fashion, light weight has been obtained without sacrifice of strength. In fact, it is a most rugged plane. A wide tread and sturdy landing gear eliminate ground looping, bouncing, and make cross-wind or one-wheel landings safe. The "22" typifies the best in aircraft performance . . . you may cruise along at 94 miles an hour in a Cirrus-powered job; or at 112 or 120 miles per hour in one of the Warner-powered jobs. This you will do in comfort and with a feeling of utmost safety and reliability. Fairchild has obtained maintenance economy in its plane by doing the more expensive things, such as cadmium plating or baked enameling all fittings, equipping control mechanisms with self-aligning ball bearings, and by engineering unessential parts out of the plane. > > > It might be expected that the Fairchild 22, with its many modern features, would sell at a high price. However, this is not so, and you will find that the Fairchild 22, by comparison, sells at a much lower price than others in its class.

Fairchild also offers a large, fine, fast cabin plane . . . the Fairchild 24. The advanced engineering and high quality of material and workmanship found in the "22" are combined to achieve the greatest value in a cabin plane. This model is available with the Warner Scarab 125 H.P. engine. > > > The Fairchild 24 is a two-place, side-by-side cabin plane, in which comfort as well as performance is emphasized. You will appreciate the added comfort found in the "24" resulting from building a wide, roomy cabin in which pilot and passenger can sit without "squeezing" . . . and cabin length affords plenty of leg room.

For easy access as well as for greater safety, a door is provided on each side of the cabin. Like the "22", the Fairchild 24 has been carefully engineered and constructed. Also, as in the "22", the many extra-value features are to be found in this model. And as to performance—to test and prove its extraordinary responsiveness and capability, you need only to spend a few minutes with the plane in the air. It is a genuine pleasure to put it through its paces . . . to enjoy the thrill of its spirited performance . . . and to have first-hand knowledge of a plane that is modern in every detail. But even this will not tell you everything you should know about the new Fairchild models. Become thoroughly acquainted with all phases of their value; send today for complete specifications and performance data.

FAIRCHILD 22 Cirrus

FAIRCHILD 22 Gipsy

FAIRCHILD 24

FAIRCHILD 22 Warner

FAIRCHILD AIRPLANE SALES CORP., WOODSIDE, NEW YORK CITY

FAIRCHILD

Models of Fairchild aircraft: the 24 with a Warner engine; the 22 and 24, each with a Cirrus and the 22 with a Warner

addition, the company maintains a large flying field three miles from the factory where a hangar was built to house the wing assembly department and the completed ships. Kreider-Reisner last year built an addition to its plant with complete facilities for anodic and heat-treating of duralumin. It is thus in its plant, completely equipped for building hulls and all-metal airplanes.

Through contact made with the company during various Fairchild engine development projects and through negotiations continued through 1928, Fairchild Aviation Corporation, in the Spring of 1929, gained a controlling interest in this company.

Following the acquisition of the Fairchild Aviation Corporation by The Aviation Corporation, manufacturing activities centered about the Fairchild KR34, a three-place open cockpit biplane and the Fairchild KR21, a two-place, tapered wing, open cockpit biplane. When Fairchild repurchased its interest from The Aviation Corporation, it completed negotiations whereby Kreider-Reisner took over the inventory of Model 71 equipment and spare parts applicable thereto from the American Airplane and Engine Corporation. Then in 1931, the company designed and produced a new two-place open, high-wing monoplane, known as the Fairchild 22, and after continuing its production through 1932, introduced that year, the Fairchild 24, a two-place cabin monoplane, a description of which appeared in the April, 1932, issue of AERO DIGEST. The latest development of the Fairchild 22 is powered by a radial engine with additional streamlining and better fairing. Its other improvements are noted in a feature article of the plane published last month in AERO DIGEST.

During the past year the business conducted by the company has steadily grown and at the present time two large transport models are under construction. Chief among the new projects is the Pan American Airways order for 10-place high-speed amphibions. The production of the widely known 22 and 24 models will be continued on a large scale during 1934 to meet the ever increasing demand among private owners and schools for ships of those types. The "Advanced 22" is available with the following power plant installations: Wright Gypsy 90 h.p.; Cirrus Inverted 95 h.p.; Warner 125 and 145 h.p. The 24 is available with the Warner 125 h.p.

Under The Aviation Corp. the company developed no new commercial airplanes in 1929 or 1930. Inside of two months after assuming control, Fairchild brought out the Fairchild 22, which sold at two-thirds the price of similar planes. During the second quarter of 1931, Fairchild was 22nd on the list of manufacturers of airplanes, from the standpoint of the number produced during the quarter. Sales increased rapidly until Fairchild was in second place. In spite of substantial decreased total sales for the aviation industry as a whole, Fairchild sales have continued to increase and Fairchild is now one of the three largest producers of commercial airplanes.

Although the Kreider-Reisner company theoretically cannot be considered an outgrowth of any other Fairchild manufacturing subsidiary, its policy is directed by the personnel who built up the manufacturing business at Farmingdale, and since its present activities are so closely allied with what Fairchild has done in the manufacturing field prior to 1931, an historical picture of the former Fairchild manufacturing subsidiaries, the Fairchild Airplane Manufacturing Corporation and the Fairchild Engine Corporation is not amiss now.

Perhaps the better known of the two companies was the old *Fairchild Airplane Manufacturing Corporation,* organized August 22, 1925, as a subsidiary of the Fairchild Aviation Corporation. Operating from a factory located in Farmingdale, Long Island, New York, it produced as one of its first models a commercial cabin monoplane with accommodations for a pilot and four passengers. Featuring folding wings, the plane had a top speed of 120 miles an hour, initial rate of climb of 1,025 feet per minute and a service ceiling of 12,400 feet with a gross weight of 3,225 pounds.

Activities during 1927 centered on the FC-2, which had become extremely popular. Development was undertaken on a high horsepower all-purpose cabin monoplane as well as on composite floats which had some distinctively novel features. These floats were of bolted construction with wood frames and alclad covering and bulkheads.

Production of cabin monoplanes was increased in 1928 fourfold over 1927. The improved FC-2, known as the Fairchild 41; a seven-passenger cabin monoplane known as the Fairchild 71 and the Fairchild 21, a two-place low-wing monoplane designed primarily for training and student flying, all were produced that year. Plant facilities were developed at Farmingdale, including an airport and a large factory building, while plans were formulated for large-scale production in 1929. Engineers experimented on and developed a new silencer which could muffle the engine exhaust, a new type landing light and a combination ski and float. At this time officials and executives were making surveys in South America to develop the company's foreign markets.

Following the acquisition of the Fairchild Aviation Corporation by The Aviation Corporation, the Fairchild Airplane Manufacturing Corp. lost some of its identity. However, production was con

The Kreider-Reisner factory at Hagerstown, Maryland

The Fairchild 71 used by Collyer and Mears during their world flight in 1928

tinued on the Fairchild 71 and the KR21, which was originally developed by the Kreider-Reisner company. The KR34, a three-place open cockpit biplane, was introduced and the Fairchild 42, a four-place cabin monoplane, was developed.

Fairchild 71's meanwhile were making history. In addition to being the original equipment on most of the new airlines that were being organized during this period, the "Stars and Stripes" made the first flights over the Antarctic continent proper on January 14, 1929, in conjunction with Commander Byrd's explorations of the South Pole, while Fairchild ships were prominently used by the Dominion Explorers, Ltd., a subsidiary of the Thayer Lindsey mining interests of Canada organized to conduct exploration in the Arctic Circle region.

The company maintained an engineering and experimental staff of approximately 75 persons; its production division was equipped with the most modern facilities available and its personnel was organized along conventional quantity production lines. Until the reacquisition of the Fairchild interests from The Aviation Corporation, it continued in production of the four models which were either in production or were being introduced in 1930.

The *Fairchild Engine Corporation* was originally incorporated under the name of Fairchild Caminez Engine Corporation for the purpose of acquiring the rights to develop and manufacture the Caminez Cam-Drive engine.

Concurrently with the development of the Cam engine, facilities were provided in the nature of a small but highly efficient modern factory and equipment for manufacturing any type of aircraft engine, located at Farmingdale, New York.

As a division of The Aviation Corporation, the company received an approved type certificate on the 6-390, a six cylinder model developed during 1930. It was an inverted, in-line, air-cooled engine developing 120 horsepower at 2,150 revolutions per minute. Experimental development of a military and commercial 12-cylinder, inverted V-type engine, was under way late in 1930.

The "Stars and Stripes", the first plane to fly over the Antarctic, January 14, 1929

When the Fairchild Aviation Corporation reacquired the majority interest in itself held by The Aviation Corporation, it transferred to the latter its interest in two manufacturing subsidiaries, namely the Fairchild Airplane Manufacturing Corporation and the Fairchild Engine Corporation. The Aviation Corporation then combined the two companies, changed the name to the American Airplane and Engine Corporation and went into production on the in-line series of engines under the name Ranger. Negotiations, however, were completed whereby the Kreider-Reisner Aircraft Company, Inc., took over from the American Airplane and Engine Corporation the inventory of Fairchild Model 71 equipment.

The destinies of the present Kreider-Reisner company are controlled by Sherman M. Fairchild, president; L. E. Reisner, vice-president, and W. H. Schwebel, vice-president and treasurer.

(*Continued on page* 66)

AIRCRAFT MIMAX FINISHES

Designed to provide most efficient performance in production and service shops, at maximum economy per finished unit, MIMAX Aircraft Finishes and related systems play an important part in the construction and long-lived service of FAIRCHILD airplanes. These products will provide conscientious builders and maintenance organizations a positive sales stimulus with assurance of low application and upkeep costs "in the shop and in the air". ¶ As standard finishes on FAIRCHILD airplanes, MIMAX Aircraft Products will continually conform in every respect to the high and exacting manufacturing standards set by the FAIRCHILD organization.

Technical data may be obtained promptly, without obligation

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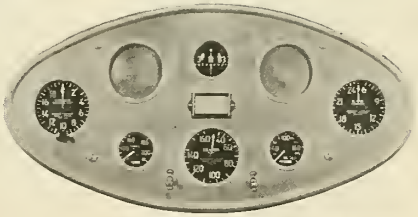

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PRIVATE FLYING

N. Y.-Miami Flight Features Races

LEADING MEN and women sportsmen pilots gathered at Roosevelt Field, New York, for the start of a 1,300-mile flight to the Sixth Annual All American Air Races which will be held at the Miami Municipal Airport, January 11-13.

In announcing the program of the races, Andrew H. Heermance, Director of Aviation for the city of Miami, said that no less than eleven speed races are scheduled and preparations were being made to care for about 500 planes. Among the races featured are the Glenn Curtiss Memorial Trophy Classic; the Colonel H. R. H. Green Trophy Race and a free-for-all race for planes of any horsepower.

A galaxy of flying stars are expected to attend, among them Al Williams, Mae Haizlip, Alexander de Seversky, John Livingston, Pete Sones, F. William Zelzer, Frank Hawks, Jimmy Doolittle, E. E. Aldrin, Jimmy Mattern, Wiley Post, Harold Gatty and Helen McClosky.

The program will be rounded out with a number of performances by Army, Navy and Marine squadrons and by events in bomb dropping, dead stick landing, aerobatics, parachute jumping and special sportsman pilot contests.

The Annual Florida Air Tour, which has developed into one of the largest of its kind in the country, will take off from the Miami Municipal Airport on January 15 and fly under the command of Major A. B. McMullen and Fred V. Blair to more than a dozen Florida cities.

Amateur Pilot Grade Created

LIBERALIZATION OF rules for pilots and the establishment of a new grade—amateur pilot, with 25 hours' solo flying time required—were outstanding amendments to the Air Commerce Regulations announced by Eugene L. Vidal, Director of Aeronautics.

The amendments include the establishment of new ratings for approved flying schools to provide for the amateur pilot's license grade and the enlargement of the privileges of the private pilot and limited commercial pilot permitting them to carry guests, executives and employes of companies employing them unlimited distances and to demonstrate aircraft to prospective purchasers.

Tucson To Repeat Air Show

THE SECOND annual Tucson Air Show, a civic enterprise, will be held February 17-18, the week-end preceding the annual Southern Arizona rodeo, "La Fiesta de los Vanqueros."

Since the show precedes the rodeo this year, officers of the Tuscon chapter of the N.A.A. expect to attract a greater number of spectators than last year when 7,000 attended the events.

The committeemen in charge of the events include Allen L. Stephens, president of the local chapter of the N.A.A.; Dale Myers; Dr. W. Claude Davis, Pete Waggoner and Major W. J. Foy.

BIRDS FED FROM AIR

TEN TONS of grain were showered over seven northern counties of New Jersey when 18 planes participated in the Winter Bird Feeding Program of the Consolidated Sportsmen of New Jersey, a league of fishermen, hunters and conservationists. The program was carried out with the cooperation of the Wright Aeronautical Corp., which furnished a majority of the planes and Paterson, N. J., feed merchants who donated the grain. This bird feeding flight was the second to be carried out by the Consolidated Sportsmen.

Physicians Fly To Aid Natives

TWO NAVY planes recently flew from Coco Solo to San Blas Islands carrying a doctor and a scientist to investigate claims of natives on the Island of Ustupo that a mysterious malady transmitted by worms had caused the demise of 100 Indian children. The doctors were Roberto Duque, official physician of the Panamanian Province of Colon and Theodore Nieumann, German specialist on tropical diseases.

Each plane carried medical, scientific and sanitary equipment.

Pinchots Pass Examinations

GOVERNOR AND Mrs. Gifford Pinchot of Pennsylvania are holders of student pilot licenses and are learning to fly so that, instead of riding as air passengers, they can fly their own planes.

Both the Governor and his wife have had a considerable number of hours in the air as passengers, but despite their ages (the Governor is 68) they have found that they would rather pilot themselves than have others fly them.

Feature Aerial Delivery Service

THE DISTINCTION of being one of the pioneers in its line to supply customers with an airplane delivery service belongs to the Rochester Photo Supply Company of Tulsa, Okla., which has purchased a Stinson Junior to facilitate rapid delivery to any part of the state. The service has been found particularly beneficial for supplies ordered by oil field operators and is said to speed up delivery to the point of becoming commercially valuable in its particular field.

Women Work As Air Police

THREE WASHINGTON, D. C. women have been chosen as the nucleus of the Women's International Aerial Police of the Women's International Association of Aeronautics and are now acting in the capacity of special police for the Washington district.

The women appointed are Miss Helen Cavis, Miss Harriett Sackett and Mrs. Genevieve Savage, wife of an army officer. Mrs. Ulysses Grant McQueen was in a large measure responsible for the initiation of the organization in Washington.

Mercy Plane Penetrates Arctic

AN AIRPLANE conquered the wilds of the Canadian Northwest and brought safely back to civilization four men who were left to fight the cold of the Arctic Circle when their schooner was destroyed by fire. When word reached John Bythell of the plight of the men, he took off with a doctor and supplies and after successfully completing the flight brought them back for medical treatment in Cameron Bay.

The flight by Bythell added another chapter to his experiences as a mercy pilot.

Find Diversified Use For Planes

AIRPLANES WERE used for fire patrols or transportation this season in five of the eight national forests of the United States, exclusive of the outlying possessions.

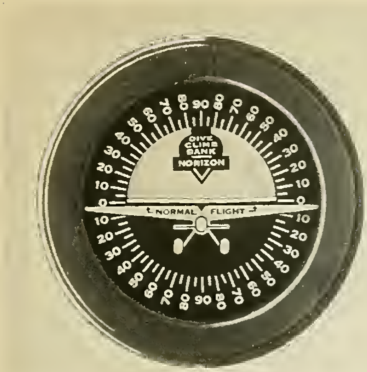
Planes transported 971 men and 498 flying hours were devoted to patrol work during the season of 1933, according to the Forest Service, U. S. Department of Agriculture. Reports shown that 164,930 pounds of emergency equipment and supplies were delivered to remote national forest points by plane.

Splendid cooperation of air transport pilots in detecting and reporting forest fires was received by the Forest Service.

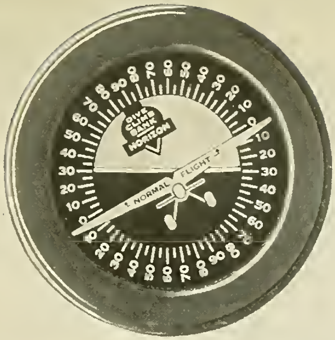
Youth Gets Air Trip

A NEW YORK-SAN FRANCISCO and return flight was the prize won by Ben Anderson, Jr., of Rutherford, N. J., for his letter describing a delayed parachute jump by Clem Sohn, member of Airaces, Inc. A five-day stopover in San Francisco with all expenses paid was included in the prize presented by the Daily Mirror for its National Air Pageant Contest.

Anderson made a survey of United Air Lines' ground and air facilities and will probably tell his experiences in a series of articles for the Rutherford *Republican,* a local newspaper for which he is writing aviation articles.



NORMAL FLIGHT ON HORIZON



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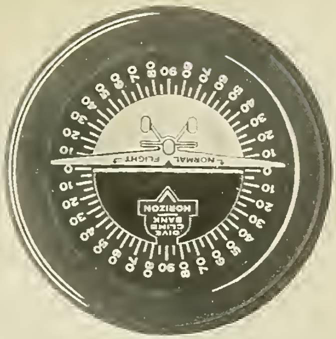

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HERE is an instrument, complete in itself, which will win the respect of the aircraft industry. The Angle-O-Meter is a *new,* inexpensive artificial horizon, designed in the interests of safety and made available at a price which every pilot and aircraft operator — both commercial and private—can afford to pay. ¶ By means of a miniature airplane (part of the dial), the Angle-O-Meter provides an artificial horizon when no natural horizon is visible, which is simple to interpret under all conditions and in any attitude. It is as efficient in inverted flight as it is in normal position. The Angle-O-Meter indicates instantly any deviation of position from level horizontal flight, showing at a glance in actual degrees, the angle of dive, climb or bank. ¶ Glider pilots and operators of lighter-than-air craft also will appreciate the Angle-O-Meter. In training, it permits student pilots to check the angle of their banks, turns and dives, thus simplifying flight instruction. ¶ Assembled with extreme precision (and, incidentally, guaranteed for two years against mechanical defects) it is as dependable in performance as it is simple in construction. The Angle-O-Meter weighs less than two pounds and requires only a small space—the frame diameter, 3¼"; diameter of the instrument behind the panel, 2¼"; total depth, 2¾". ¶ Because the Angle-O-Meter is self-contained it is easily installed, requiring no special talent or tools.

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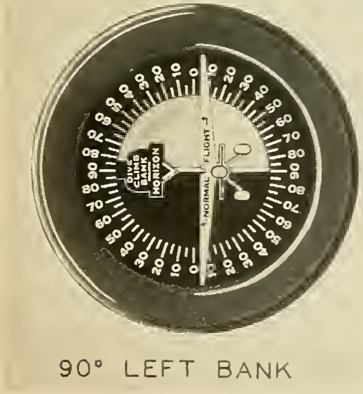

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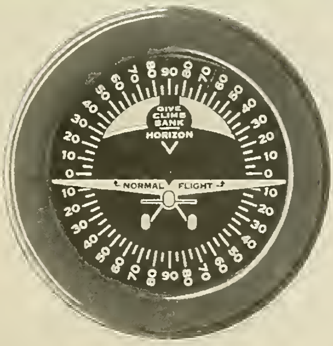

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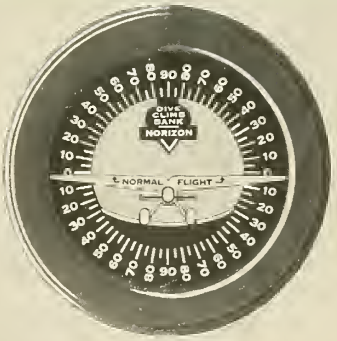

30° DIVE

NEWS OF THE SCHOOLS

Parks Air College Expands

SIMPLIFICATION, enlargement and improvement of its curriculum has elevated aeronautical study at Parks Air College, E. St. Louis, Ill., to a new and higher plane. Simultaneously all courses were placed on a regular college basis and degrees of Bachelor of Science in Engineering, Aircraft Administration and Aviation Mechanics will be conferred on successful graduates.

Courses are divided into regular terms of 12 weeks each, four such terms constituting the entire school year. The Airplane and Engine Mechanics' Course has been increased from 31 to 36 weeks while the Master Mechanics' Flight Course will take two years instead of 53 weeks. Other changes in courses include extension of the Executive Transport Pilots' Course from 72 weeks to 2 years and the Aircraft Executive Course from 28 weeks to one year.

Aeronautical Engineering has been added to the curriculum as a two year course leading to the degree of Bachelor of Science in Engineering and entrance payments have been lowered.

Norman O. Anderson, formerly head of the Parks Executive School, has been placed in charge of the Engineering and Business Schools as Dean.

School Gets Equipment

TWO ARMY planes, a Curtiss D-12 pursuit and a Liberty 02-H, have been received at the Mississippi State College for use in the newly created aviation ground school. The ships were sent from the army field at San Antonio and will be used for instruction purposes only.

New Operators at Valley Stream

UNITED SCHOOLS of Aeronautics, Inc., has taken over operation of the Curtiss-Wright School of Aeronautics at Valley Stream, L. I., where it will continue the mechanics' course, the one-year Practical Aeronautical Engineering course, and school service work. The new company will also operate under the repair base certificate issued by the Department of Commerce which covers repair work on engines and planes.

The school is under the supervision of R. L. Esslinger, Bruce Johnson, F. J. Pollard, E. R. Southee, Gilbert Trimmer, W. C. West and G. E. Woods.

SAA Meets in New York

A NUMBER of important decisions marked the fall meeting of the directors of the Soaring Society of America who gathered in New York City to discuss 1934 plans.

Richard C. duPont was elected vice-president and steps were taken to provide a secretary and general manager. Among the topics discussed were the location of the site for the 1934 soaring contest, the designation of a Pacific Coast division and the approval of a conference on gliding and soaring matters with the Aeronautics Branch of the Department of Commerce.

A committee on airworthiness requirements, headed by Ralph Barnaby, was appointed to make a study of these problems and meet with the Department of Commerce for mutual consideration of changes and improvements in the Federal regulations.

BELLEFONTE ACADEMY OFFERS COURSES

WITH THE reorganization of Bellefonte Academy, Bellefonte, Pa., into the Bellefonte Academy and School of Aeronautics, one of the oldest private schools in the country has joined the ranks of aviation instructional institutions, by offering two complete courses, one in Aviation Mechanics and Business and the other in Aeronautical Engineering. Flight instruction is also given on the school's newly developed airport.

George T. Starck, formerly with the Guggenheim School, New York University, is in charge of the 60 enrolled students.

Ground School Opened

MIDWEST AIRWAYS, Inc., operating on the Milwaukee County Airport, Milwaukee, Wis., has opened a ground school in the School of Engineering Building, Milwaukee.

Instruction is under Dwight S. Mills and the term runs for six months, a class being conducted one night each week. The curriculum includes a study of airplanes, engines, navigation, meteorology, instruments, theory of blind flight and airports and airways.

More Instructors at Ryan

THE RYAN School of Aeronautics, San Diego, Calif., has increased its staff of instructors in the mechanical department with the appointment of Edward Morrow and Mel Thompson. Morrow will take charge of all welding instruction and repair while Thompson will serve as assistant to the instructor in charge of the school woodworking and fabric departments.

Flying Club Organized

TWELVE MEMBERS of the Coffeyville Flying Club, Coffeyville, Kans., are taking instruction in ground school work from S. M. Story, who formed the association. A Barling NB-4 is used for instruction purposes.

Michigan Aeronauts Organize

THE AERONAUTICAL Activities Association of Michigan has been organized in Detroit, Mich., as a non-profit organization with a number of objectives aimed to foster the growth of aviation in Michigan. Its officers are Robert B. Evans, president; Garnet A. Sweezey, vice-president; Alfred V. Verville, vice-president; Earl J. Smith, executive vice-president; Thomas B. Colby, secretary and Edward J. Hill, treasurer.

The group plans to coordinate the various aeronautical associations and special events into a state-wide representative association; to sponsor, support or produce shows, circuses, races, tours and special attempts to lower national and international records; to assist in the development and maintenance of airports and emergency landing fields; to stimulate interest in gliding and lighter-than-air activities and to promote commercial air transportation.

Many Enter Boeing Contest

WITHIN A few weeks of the announcement of the Fifth Annual W. E. Boeing Aviation Scholarship competition, hundreds of inquiries and entries have been received at the Boeing School of Aeronautics, Oakland Airport, Calif.

The competition, based on an essay contest, will close April 1, 1934, when prizes valued at $7,500 will be given away. The first award will be a complete Boeing Master Pilot course.

Start Ground School in Joplin

A GROUND course is being given to students of the Joplin, Mo., high school by Frank Wallower, Jr., who is teaching such topics as parachutes and radio, airplanes, engines, aerodynamics, air commerce regulations, air traffic rules, navigation and meteorology.

More than 140 boys are enrolled for the course which at present is being given once a week.

Students Fly to Mexico

NINE STUDENTS and pilots from the Ryan School of Aeronautics, San Diego, Calif., were among the entries in the recent southern California Sportsman's Air Tour to Ensenada, Mexico. The Ryan School contingent made the flight in Great Lakes planes.

School Reports Successful Year

AT THE conclusion of its first year of operations, the Casey Jones School of Aeronautics, Newark, N. J., reported an enrollment of students which was larger than any other institution of its kind in the country, with 120 students registered. Only mechanical ground school subjects and engineering courses are taught.

GLORIA A SPARTAN

POR ALABANZAS DE LOS PILOTOS MEXICANOS A LA ESCUELA DE AVIACION SPARTAN

[GLORY TO SPARTAN FOR PRAISES FROM THE MEXICAN PILOTS TO THE SPARTAN SCHOOL OF AERONAUTICS]

When the leading aviators of the Mexican Army were in Tulsa recently to take delivery of the latest order of Spartan Training Ships for the Government of Mexico, they spent several days inspecting the Spartan School of Aeronautics. They studied the Spartan system of instruction and proclaimed it a most practical thorough course, taking back with them many of the exclusive Spartan principles to be incorporated in their Mexican schools of flight instruction.

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★ Further practical instruction on all types of ships is given the student in the Spartan Government Approved Repair Station No. 50, one of the highest rated in the Southwest.

Spartan incorporates the 3 STAR principle of instruction—*School, *Factory, *Shop—in all its courses of aeronautics—the most complete, thorough and practical courses of instruction you can buy, guaranteed by a MILLION DOLLAR institution. Before you enroll in any school you should first know ALL the story of 3 STAR Spartan Courses proclaimed by pilots who know, both of this and foreign countries as well—*as the greatest forward steps offered those planning a future in aviation.* Write today!

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Private Pilot's Flight and Ground Course......	375.00
Master Mechanic's Flight Course (15 hours)...	300.00
Master Mechanic's Ground Course (5 months)...	225.00
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AVIATION ENGINEERING

TECHNICAL EDITORS: GLENN D. ANGLE • PROF. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

The Maximum Lift Coefficient

PART TWO: ANALYSIS OF EXPERIMENTAL DATA

ALEXANDER KLEMIN
Daniel Guggenheim School of Aeronautics
New York University

Part I of this Article gave an elementary theoretical statement of the subject. Part II reviews the experimental data relating to the maximum lift coefficient. Experimentation has been extensive but not particularly systematic. Some general conclusions are possible, however. The major parts of the curves and calculations were prepared by W. Selikoff, graduate of the Guggenheim School of Aeronautics.

● Many factors influence the value of the maximum lift coefficient of an airfoil as obtained in any given tunnel. These factors include: technique of observation; methods of suspension; oscillation of the model at the stall; size and shape of the working section in relation to the span and area of the airfoil; turbulence of the air stream; and the Reynolds' Number at which the test is made. Increase in turbulence and increase in Reynolds' Number generally produce similar effects, though they are by no means interchangeable factors. They are, however, the most important factors, and it is on turbulence and scale effect that attention will be concentrated.

Turbulence of Wind Tunnels

The turbulence of a wind tunnel is indirectly measurable by the resistance of a sphere or a cylinder or an airship form. In the case of a sphere or a cylinder (as shown in Part 1) increasing turbulence at the same Reynolds' Number decreases the drag coefficient. In the case of an airship form, separation effects are less important and surface drag accounts for the greater part of the resistance. The drag of an airship at the same Reynolds' Number therefore increases with increasing turbulence of the air stream.

Tests of the "NPL Standardization Model, Long Airship" indicate that the turbulence of American tunnels, in descending order of magnitude, is as follows:

1. Variable density tunnel (original).
2. Washington Navy Yard tunnel.
3. NACA atmospheric tunnel, 5-foot.
4. M.I.T. tunnel, 7½-foot.
5. Bureau of Standards tunnel, 10-foot.

The results of various sphere drag tests are summarized in the following table, where the R.N. for $C_D = .3$ is taken as the critical number. Increasing value of the critical R.N. indicates lessened turbulence, $R.N. = \frac{Ud}{v}$ where d = diameter of sphere and v = coefficient of kinematic viscosity.

TABLE I

Tunnel	R.N. for $C_D = .3$
Variable density tunnel (original)	60,000
V.D.T. (redesigned, closed throat with screen)	65,000
V.D.T. (redesigned, closed throat)	120,000
N.P.L. tunnels	150,000
V.D.T. (redesigned, open throat)	160,000
N.Y.U., 9 ft.	190,000
Langley Field atmospheric, 5-ft.	200,000
Bureau of Standards, 10-foot	230,000
Göettingen	270,000
California Institute of Technology	320,000
Free air (towing tests at C.I.T.)	370,000
Free air (towing tests at Langley)	375,000
Free air (dropping tests at Langley)	400,000

We may therefore classify tunnels from a turbulence point of view as follows:

A. Old V.D.T. closed throat; redesigned V.D.T. closed throat with screen.
B. V.D.T. redesigned, closed throat; N.P.L.; V.D.T. redesigned, open throat.
C. Langley Field 5-foot; Washington Navy Yard; Mass. Institute Technology, and New York University.
D. Bureau of Standards 10-foot; Göettingen; California Institute of Technology.
E. 20-foot propeller research tunnel; Full scale tunnel.
F. Free air.

No sphere drag tests have been made in the 20-foot propeller research tunnel, but indirect evidence (such as airfoil tests) is available to indicate that it has little turbulence. The following remarks are pertinent to this tunnel:

"The velocity without a honeycomb or air straight ever was found to be constant within 1% over the test area. This is attributed to the large reduction of area in the entrance cone. Large variations of velocity at the entrance to the cone are greatly reduced by rapid acceleration through it." Indirect evidence regarding the full scale tunnel is of the same character. In general where very large airfoils are tested in very large tunnels the "grain" of the turbulence should be relatively small.

The turbulence of a tunnel may be reduced by:

Large area at beginning of entrance cone; use of a "Prandtl" entrance cone; removal of entrance honeycomb (if consistent with good velocity distribution); use of "fine" entrance honeycomb; placing entrance honeycomb further from working section; long exit cones; vanes to remove swirl of propeller; careful guidance round bends; or long return passages.

Study of the various tunnels listed above will indicate that their degrees of turbulence are explainable in the light of the above remarks.

(*References*: *The Effect of Turbulence, Aircraft Engineering, Aug.* 1933; *NACA T.R.* 185, 300 *and* 342; *NACA T.N.* 264 *and* 312; *NACA T.M.* 475.)

Airfoil Profile Characterization

In the characterization of the airfoils presented, the following procedure has been adopted:

"If the distance between the leading edge of the airfoil and the center of curvature of the leading edge is bisected at E, and the same is done for the trailing edge at E′, then the X axis should pass through EE′ and the origin bisects the distance EE′."

The "aerodynamic chord" is then defined as the segment of the axis intercepted by the airfoil. The "standard chord" in terms of which the airfoil is usually empirically defined does not in general coincide with the aerodynamic chord.

In the theoretical pressure diagrams presented in Part I the "aerodynamic chord" is employed for determining the angle of incidence. Wind tunnel force results are almost invariably referred to the standard chord.

The maximum mean camber in position and magnitude is referred to the aerodynamic chord.

The maximum thickness in position and magnitude is also referred to the

FIG. 1 NACA 0006

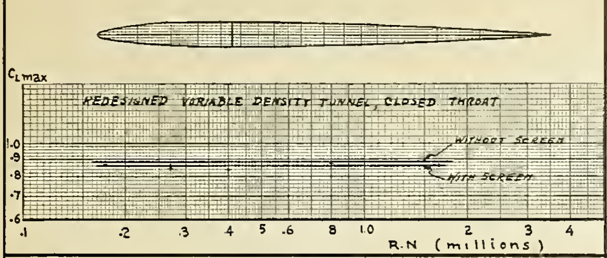


FIG 3 NACA 0021

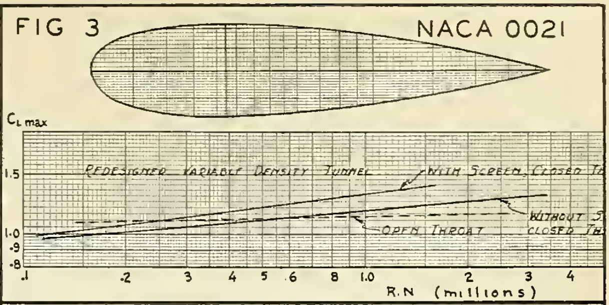


FIG. 2 RAF 30

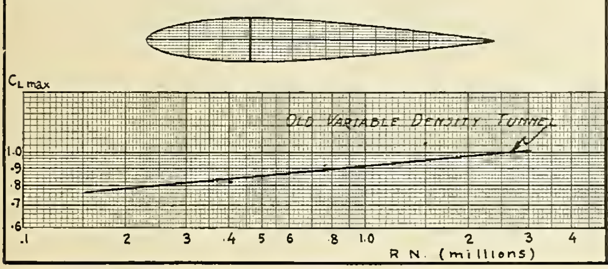
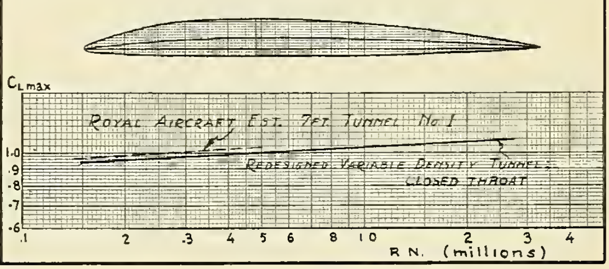


FIG. 4 A D.1



aerodynamic chord, and the thickness is measured on a line perpendicular to the aerodynamic chord.

In the data presented here rectangular airfoils of aspect ratio 6 have been employed throughout.

(*Reference*: *NACA T.R.* 465.)

Classification of Airfoils

In the course of the investigation, the following classification and nomenclature have been arbitrarily adopted.

Camber: (Maximum camber of mean camber line).

a. Zero camber......... 0
b. Low camber......... 0 to 3.5%
c. Medium camber......3.5 to 5.0%
d. High camber........5.0 to 6.5%
e. Very high camber..... over 6.5%

Thickness: (Maximum, referred to aerodynamic chord).

a. Thin airfoil........ 6 to 10 %
b. Medium thickness.. 10 to 12.5%
c. Thick airfoil.......12.5 to 18.5%
d. Very thick airfoil... over 18.5%

Experimental data are not available for all the above classifications and exact placing of particular airfoils is sometimes difficult. Nevertheless it is useful to have some such classification in mind when making a detailed study of experimental results.

Expression Relating $C_{L\,max}$ to R.N.

When $\log_{10} C_{L\,max}$ is plotted against $\log_{10}$ (R.N.) a lineat relationship is frequently found and an empirical expression of the following type can then be written down:

$$C_{L\,max} = \underset{(R.N. = 10^5)}{\underset{\text{at}}{C_{L\,max}}} \left(\frac{R.N.}{10^5}\right)^n$$

NACA 0006 Zero Camber, Thin Airfoil (Fig. 1)

Zero camber, maximum thickness, 6% at 30% of the chord. (Redesigned V.D.T. closed throat.)

R.N.	$C_{L\,max}$
180,000	0.88
3,500,000	0.875
1,600,000	0.86

The scale effect is neutral. Artificial turbulence created by the introduction of a coarse screen lowers the maximum lift coefficient by a constant, very small amount throughout the range of the test. For such an airfoil, no corrections to $C_{L\,max}$ would seem to be necessary from a value obtained in either a typical atmospheric tunnel or the V.D.T.

(*References*: *NACA T.N.* 364 *and* 385.)

R.A.F. 30 Zero Camber, Medium Thickness Airfoil (Fig. 2)

Zero camber, maximum thickness 12.5% at 30% of the chord. (Old V.D.T.)

R.N.	$C_{L\,max}$
152,000	0.761
1,500,000	1.067

The only data available is on a model of the Bristol Fighter biplane.

There is an appreciable scale effect in

$$\left(\frac{R.N.}{10^5}\right)^{.095}$$

the old V.D.T. with $C_{L\,max} = .73$

After studying the curves for the NACA 0021, the Clark Y, and NACA 2412 we may be reasonably certain that the slope, and the $C_{L\,max}$ values at high R.N. are far too high—to what extent it is impossible to say.

(*References*: *British R & M* 928. *NACA T.R.* 279.)

NACA 0021 Zero Camber, Very Thick Airfoil (Fig. 3)

Zero camber; maximum thickness 21% at 30% of chord.

V. D. Tunnel	R.N.	$C_{L\,max}$
Closed throat.......	83,000	.95
Closed throat.......	1,500,000	1.20
Closed throat.......	3,300,000	1.20
Closed throat (with screen)	1,620,000	1.40
Open throat.........	1,520,000	1.14

From the curves of Fig. 3 it is quite clear that turbulence exaggerates the increases in lift due to scale effect. As the turbulence diminishes the slope diminishes likewise.

The three expressions are:

$$C_{L\,max} = .979\left(\frac{R.N.}{10^5}\right)^{.1278} \text{closed throat,}$$

with screen.

$$C_{L\,max} = .960\left(\frac{R.N.}{10^5}\right)^{.0876} \text{closed throat.}$$

$$C_{L\,max} = 1.075\left(\frac{R.N.}{10^5}\right)^{.0095} \text{open throat.}$$

For an airfoil of this type we would be inclined to take an atmospheric tunnel value of maximum lift coefficient at say 300,000 R.N. and to use such a value without correction.

(*References*: *NACA T.R.* 391 *and NACA T.N.* 364 *and* 385.)

A.D.I Low Camber, Thin Airfoil (Fig. 4)

Maximum camber 2.4% at 38% of chord; maximum thickness 8.1% at 38% of chord.

Tunnel	R.N.	$C_{L\,max}$
R.A.E. 7-foot	286,000	1.000
V.D.T. redesigned (closed throat)...	2,720,000	1.100

The slope of the curve is slight, and from tests in tunnels of different degrees of turbulence the effect of turbulence is seen to be slight also.

The presumption is that the V.D.T. results may be accepted without correction. A full flight test of a British biplane confirms this view.

The expression relating to $C_{L\,max}$ and R.N. is

$$C_{L\,max} = .92\left(\frac{\text{R.N.}}{10^5}\right)^{.055}$$

(*References*: *British R & M* 943 *and* 1357.)

R.A.F. 15 Low Camber, Thin Airfoil (Fig. 5)

Maximum camber 3% at 30% of chord, maximum thickness 6.5% at 15% of chord.

Tunnel	R.N.	$C_{L\,max}$
L.M.A.L. 5-foot....	104,000	1.078
Bureau of Standards 10-foot	318,000	1.093
N.P.L. 7-foot......	461,000	1.059
Old V.D.T.........	3,580,000	1.209

For the case of the R.A.F. 15, a low camber thin airfoil of the unsymetrical double cambered type, we are fortunate in having the results of the International Standardization Tests made on the same airfoil in various N.P.L. tunnels, the L.M.A.L. 5-foot tunnel, the Bureau of Standards 10-foot tunnel, the M.I.T. 7½-foot tunnel, McCook Field 10-foot tunnel and the old V.D.T. The composite logarithmic curve of Fig. 5 indicates very slight variation in $C_{L\,max}$ in the atmospheric tunnels. At moderate values of the R.N., the V.D.T. curve falls on the curve of the atmospheric tunnels. It is only at the highest values of the R.N. that the cumulative effects of excessive turbulence and scale effect make themselves felt excessively. The presumption is that for an airfoil of this type the scale effect is very slight, that turbulence effect is slight, and that the relationship between $C_{L\,max}$ and R.N. is of the form:

$$C_{L\,max} = 1.06\left(\frac{\text{R.N.}}{10^5}\right)^{n\,=\,\text{almost zero}}$$

(*References*: *NACA T.R.* 233, 309, 331. *British R & M* 954.)

NACA 2412 Low Camber, Medium Thickness Airfoil (Fig. 6)

Maximum camber 2% at 40% of chord, maximum thickness 12% at 30% of chord.

Tunnel	R.N.	$C_{L\,max}$
V.D.T.	500,000	1.31
V.D.T.	3,000,000	1.50
C.I.T.	250,000	0.99
C.I.T.	1,750,000	1.25

For the NACA 2412 in Fig. 6 the lowest curve for $C_{L\,max}$ against R.N. based on tests at C.I.T. without screen. The other curves were obtained by the artificial introduction of turbulence by the use of screens. The curve for the variable density tunnel (redesigned, closed throat) was obtained by interpolation with due regard to its turbulence, as only one experimental point was available. The following table summarizes the relationships between $C_{L\,max}$ and R.N. for the various degrees of turbulence:

Critical R.N. for sphere	$C_{L\,max}\left(\frac{\text{R.N.}}{10^5}\right)^n$	Tunnel
100,000	$C_{L\,max} = 1.15\left(\frac{\text{R.N.}}{10^5}\right)^{.113}$	C.I.T. screen at 10½″
120,000	$C_{L\,max} = 1.1\left(\frac{\text{R.N.}}{10^5}\right)^{.113}$	V.D.T.
180,000	$C_{L\,max} = .94\left(\frac{\text{R.N.}}{10^5}\right)^{.113}$	C.I.T. screen 48″ from model
330,000	$C_{L\,max} = .89\left(\frac{\text{R.N.}}{10^5}\right)^{.113}$	C.I.T. (no screen)

From these curves it would appear that the exponent n has the same values for all degrees of turbulence, but that the constant increases with turbulence. It is also seen that at low values of R.N. values tend to converge. With a reasonable scale run and information as to the degree of turbulence present, it should be possible to predict full scale values quite well for this type of airfoil, starting with a R.N. of about 300,000.

(*References*: *The Effects of Turbulence, Aircraft Engineering, Aug.* 1933. *NACA T.R.* 465.)

Clark Y Medium Camber, Medium Thickness Airfoil (Figs. 7A and 7B)

Maximum camber 3.7% at 4% of chord, maximum thickness 11.73% at 30% of chord.

Tunnel	R.N.	$C_{L\,max}$
New V.D.T........	500,000	1.25
New V.D.T........	4,000,000	1.60
F.S.T.	500,000	1.15
F.S.T.	4,000,000	1.42
New V.D.T. (with screen)	200,000	1.25
New V.D.T. (without screen)......	200,000	1.25
New V.D.T. (with screen)	1,500,000	1.49
New V.D.T. (without screen)......	1,500,000	1.40

Several definite conclusions emerge from the data for this airfoil.

1. The scale effect is appreciable.
2. The effects of turbulence and scale are cumulative.
3. At low values of the R.N., values
4. Additional turbulence increases the
tend to converge irrespective of the turbulence.

FIG 5 RAF 15

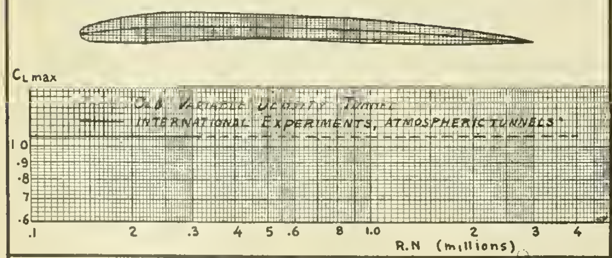


FIG. 7A CLARK Y

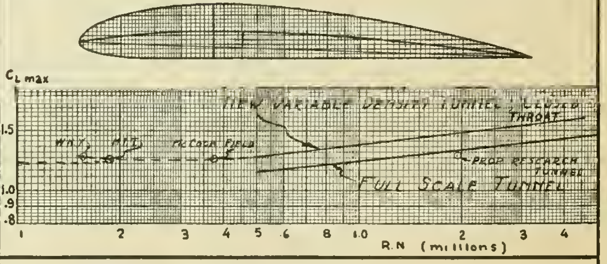


FIG 6 NACA 2412

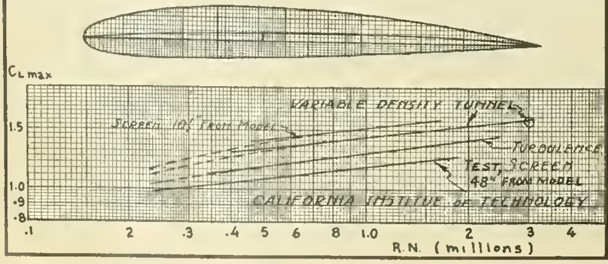


FIG 7B CLARK Y

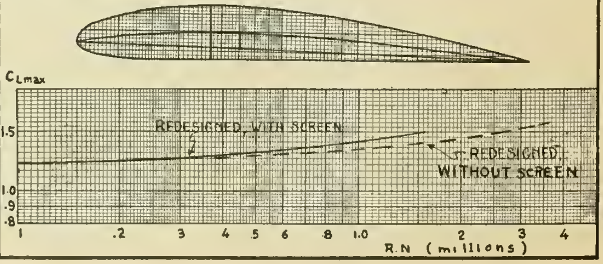


FIG. 8 GOETTINGEN 387

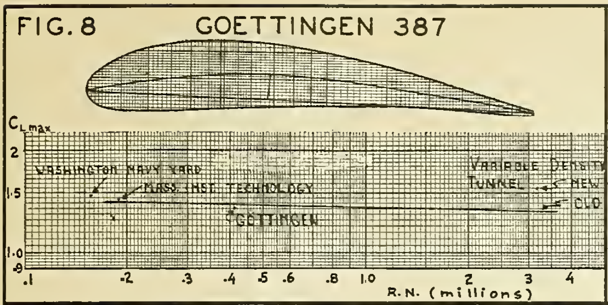


FIG. 10 RAF 19

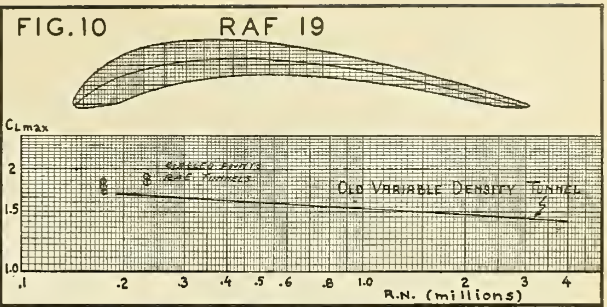


FIG. 9 USA 35 A

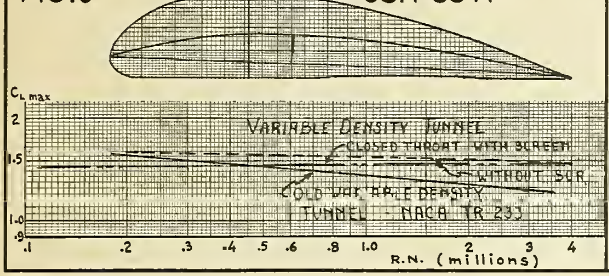
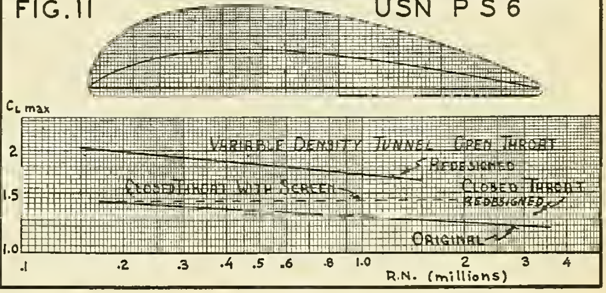


FIG. 11 USN P S 6



slope of the curve of $C_{L\,max}$ against R.N.

5. The Full Scale Tunnel and the Propeller Research Tunnel check each other, and are both free from turbulence, or at least the grain of the turbulence is very small in relation to the size of the airfoils tested in these two tunnels.

6. For the V.D.T. without screen we have

$$C_{L\,max} = 1.04\left(\frac{\text{R.N.}}{10^5}\right)^{.1195}$$

7. For the F.S.T.

$$C_{L\,max} = .98\left(\frac{\text{R.N.}}{10^5}\right)^{.1085}$$

For an airfoil such as the Clark Y, the turbulent V.D.T. gives both too high a lift and too high a slope. At low values of the R.N. the V.D.T. checks with the atmospheric tunnels. The procedure in evaluating from an atmospheric tunnel test for this type of airfoil would be to reduce the maximum lift coefficient by say .06 and scale up with an exponent $n = .10$ to $.11$ from a R.N. of about 300,000 to 500,000.

(*References*: *The Aerodynamics of Wing Sections, S.A.E. Sept.* 1933, *by Eastman N. Jacobs. NACA T.N.* 364. *NACA T.R.* 331 *and* 336.)

Göettingen 387 High Camber, Thick Airfoil (Fig. 8)

Maximum camber 6% at 40% of chord, maximum thickness 15.18% at 30% of chord.

Tunnel	R.N.	$C_{L\,max}$
W.N.Y., 8-foot......	156,000	1.488
Old V.D.T.	440,000	1.383
Old V.T.D.	3,470,000	1.328
New V.D.T.	3,160,000	1.56

The expression relating $C_{L\,max}$ and R.N. is

$$C_{L\,max} = 1.425\left(\frac{\text{R.N.}}{10^5}\right)^{-.0193}$$

Part of the negative slope is evidently due to turbulence however, since the redesigned V.D.T. gives a higher value of $C_{L\,max}$ than the old V.D.T. The exponent is small. It may be surmised that atmospheric tunnel values can be used without correction. This view is confirmed by a full flight test of a Fairchild monoplane where $C_{L\,max}$ was 1.50 at R.N. of approximately 4,000,000.

(*References*: *NACA T.R.* 331. *NACA T.N.* 362 *and* 428.)

U.S.A. 35 A High Camber, Thick Airfoil (Fig. 9)

Maximum camber 6.5% at 40% of chord; maximum thickness 18.22% at 30% of chord.

R.N.	$C_{L\,max}$
180,000	1.570
3,520,000	1.203

The decrease in lift is evidently exaggerated by turbulence as can be seen from the slope of the curves. The low R.N. value in a typical atmospheric tunnel can be used without correction.

(*References*: *NACA T.R.* 233, 331.)

R.A.F. 19 Very High Camber, Thin Airfoil (Fig. 10)

Maximum camber 11% at 35% of chord; maximum thickness 9.2% at 20% of chord.

Tunnel	R.N.	$C_{L\,max}$
R.A.E. 7′ × 7′....	175,000	1.770
R.A.E. 4½′ × 4½′	233,200	1.864
Old V.D.T.	191,500	1.69
Old V.D.T.	4,000,000	1.41

$$C_{L\,max} = 1.76\left(\frac{\text{R.N.}}{10^5}\right)^{-.06}$$

Examination of the curves indicates that turbulence probably exaggerates the decrease in lift due to scale effect.

(*References*: *British R & M.* 1363. *NACA T.R.* 279.)

USN P S 6 Very High Camber, Very Thick Airfoil (Fig. 11)

Maximum camber 9.98% at 30% of chord; maximum thickness 19.96% at 30% of chord.

V.D.T.	R.N.	$C_{L\,max}$
Open throat, redesigned	153,000	1.94
Open throat, redesigned	1,480,000	1.63
Closed throat, redesigned	3,280,000	1.30
Old tunnel...........	172,000	1.420
Old tunnel............	3,550,000	1.181
Closed throat, with screen	173,000	1.460
Closed throat, with screen	1,590,000	1.435

Here again the curves indicate that turbulence exaggerates the decrease lift due to scale. The values of lift at the same high R.N. increase as turbulence diminishes.

(*References*: *NACA T.R.* 259, 352, 391, *NACA T.N.* 364.)

Discontinuities in the Lift Curve of Thick Airfoils

In the course of this investigation, it was noted that discontinuities in the lift curve (at maximum lift) for such thick airfoils as NACA 0021 and USN P S 6 when tested at low R.N. are eliminated either by turbulence or by increase in the R.N. A tentative explanation is as follows:

With thick airfoils and well distributed pressure, the transition point is reached far back along the upper surface (even though the boundary later is appreciable because a thick airfoil connotes a longer distance measured along the upper surface from the leading edge). An increase in the angle of incidence increases the pressure gradient at the leading edge, and we now have a high pressure gradient in combination with a thick airfoil and less favorable nose entry. The entire picture is transformed and the whole flow breaks down increased scale or turbulence, has the effect of making a much larger part of the flow turbulent and hence better able to resist the increase in pressure gradient. A thick airfoil tested at low LV should not be discarded by the designer simply because such a discontinuity is apparent.

(*Reference*: *NACA T.R.* 391.)

Working Angular Range Between Zero Lift and Maximum Lift

Consideration of space does not permit us to enter fully into the question of angular range. The situation may be generally summarized as follows:

If the line joining the extremities of the mean camber line is considered to be the chord:

1. The negative angle of zero lift will increase within the camber.
2. Scale and turbulence will have very little effect on the line of zero lift.
3. The positive angle for maximum lift will increase with the camber.
4. The working angular range of high camber, high lift wings will be appreciably greater than the working range of the low camber, low lift wing, owing to the cumulative effects of the phenomena 1 and 2.
5. If scale or turbulence increase the maximum lift coefficient, then the positive angle of maximum lift is also increased. If scale or turbulence decreases the $C_{L\ max}$ then the positive angle of maximum lift is also decreased.

If a designer, therefore, wishes to take full advantage of the higher lift values of large R.N. in a three point landing attitude, he must arrange for a higher three point landing angle.

Conclusions

In general the experimental results agree with the theoretical views given in Part I of this article. A complete theoretical study of the subject would involve systematic evaluation of the thickness of the boundary layer and of the position of the separation point, with pressure gradients obtained from actual pressure distribution tests. What is much more important from an engineer's point of view is that certain general principles emerge from apparently conflicting evidence:

(a) Where the scale effects are small, the turbulence effects are likely to be small likewise. Therefore if a test shows small scale effect, no corrections of any kind appear to be necessary.

(b) Zero camber, thin airfoils, show either no scale or comparatively little scale effect. Any rational values for such airfoils obtained in an atmospheric wind tunnel of medium or little turbulence can be used without correction.

(c) Low camber, thin airfoils show little increase in maximum lift coefficient with scale. The slope is so slight, and the agreement between atmospheric tunnels and the variable density tunnel is so good, that atmospheric tunnel values can be used for sections such as the R.A.F. 15 without much error. If, however, the low camber, thin airfoil shows at low R.N. a particularly low value of $C_{L\ max}$ then the presumption is that a scale effect exponent of something like .050 may be justified.

(d) Where the scale effect increases the maximum lift coefficient appreciably, then it may be suspected that turbulence is also important.

(e) Hence, wherever the V.D.T. shows a very large increase in maximum lift with R.N., allowance for turbulence must be made.

(f) It is with airfoils of low or medium camber, and medium thickness that the V.D.T. shows the greatest increase in lift with scale, (such airfoils as the NACA 2412 and the Clark Y). These are sections of the type most likely to be used by designers because of their all round excellency. For such sections the slope exponent n should be reduced slightly and the constant should be reduced appreciably.

(g) The tunnels most likely to give the correct values for sections of this type are the Full Scale Tunnel and the Propeller Research Tunnel.

(h) Where ordinary atmospheric tunnels are employed for testing medium camber, medium thickness airfoils, the lift should first be decreased for turbulence and then increased with an exponent n approximately equal to 0.1.

(i) As the thickness of the medium camber airfoils is increased the scale effect becomes less marked. Medium camber, thick airfoils may not need correction at all for their maximum lift values.

(j) It has been of late fashionable to assume that very high camber airfoils lose a great deal of their maximum lift with increase in R.N. The effect of scale in decreasing the maximum lift of such airfoils certainly is exaggerated by turbulence. High camber airfoils do not lose as much of their lift as the V.D.T. tests would seem to indicate.

(k) For a section such as the Göettingen 387 a very small decrease in maximum lift is sufficient. Even the U.S.A. 35 A would need very little lift reduction to full scale.

(l) Even airfoils of high camber, and of great thickness, probably lose much less of their maximum lift than indicated by the V.D.T.

(m) It is not true, therefore, that all sections will ultimately have the same maximum lift. Sections of high camber will have greater maximum lift at full scale than sections of low camber. However, angular working ranges have to be carefully taken into account where the maximum lift is to be realized in a three point landing.

Digest of Technical Articles from Foreign Publications

ELSA GARDNER

Propelling Wheels

Lifting and Propulsive Wheels (Roues sustentatrices et propulsive), C. B. Strandgren. L'Aéronautique (L'Aérotechnique Section) Vol. 15, No. 172, September, 1933, pp. 81-88, 9 figs.

THE AERODYNAMIC principles, classification and calculation of lifting and propelling wheels are discussed, and their application to airplanes in place of wings and propellers is considered. These wheels are described as similar to paddle wheels, being turning wing units carrying a certain number of wings parallel and equidistant from each other and opposite a central axis of rotation to which they are connected by arms or bracing wires. Each wing is articulated around an axis parallel to its span and can be oscillated or turned around this axis. Motion around the central axis creates an aerodynamic speed, while motion of a wing around the axis of articulation gives the angle of incidence desired with respect to the aerodynamic speed. The author refers to similar wheels proposed by Platt, Rohrbach, and Moineau as well as the Strandgren wheel.

Storage of Gasoline

The Conservation of Fuels (La conservazione dei carburanti), V. Costanzi. Rivista Aeronautica, Vol. 9, No. 10, October, 1933, pp. 82-94, 2 figs.

MEANS FOR avoiding the formation of gums and resin in aviation fuels so that they may be stored for several years are discussed. The author takes up the question of selecting a refining process and includes the addition of compounds which prevent gum formation and have the added advantage of contributing antiknock qualities to the fuel.

Propeller Interference

Influence of the Propeller on the Aerodynamic Characteristics of the Wing (Sulla influenza dell'elica sulle caratteristiche aerodinamiche dell'ala), C. Ferrari. L'Aerotecnica, Vol. 13, No. 8, August, 1933, pp. 989-996, 2 figs.

EFFECT of the axial increment induced by the propeller on the distribution of the circulation along the wing span is studied. The author finds that it is zero for the hypothesis that the axis of propeller thrust lies in the plane of the zero lift of the wing. He derives the correct lift and drag coefficients for the wing alone and then the coefficients of the wing in the presence of a propeller, showing that they increase as the first power of the average increment of the velocity induced by the propeller except that drag increases much more than lift. He describes the results obtained in the aerodynamic laboratory of the University of Turin with a trapezoidal wing of No. 420 Goettingen airfoil, and with a small Goettingen engine operating at a very high speed placed outside the wing and turning a propeller having a pitch-diameter ratio of 1. These results confirmed his theory.

British Research

Report for the Year 1932-33. (British) Aeronautical Research Committee, 94 pp., 4 figs.

THIS REPORT summarizes the aeronautical research supervised by the various subcommittees in the past year and refers to some of the outstanding results obtained. In his introduction, the Chairman, H. T. Tizard, points out the progress made in providing further equipment for aerodynamic research and describes a novel design of balance developed by E. F. Relf for the N. P. L. compressed-air tunnel. Under the heading of aerodynamics, he reviews research on flutter and buffeting, spinning, stability and control at and above stall, performance, propellers, landing and take-off characteristics, and fluid motion. He refers to the development of a device for the automatic control of fuel-air mixtures which was of great assistance in engine research and tells of the work done on supercharging, lubrication, fuels, and flame traps. He also describes the research on structures, materials, seaplanes, atmospheric turbulence, and noise. Each Committee's report is given including the research undertaken at various British universities.

Tail Buffeting

Tail Buffeting, W. J. Duncan, Royal Aeronautical Society Preprint for meeting November 30, 1933, 26 pp., 15 figs.

INVESTIGATIONS on buffeting which were conducted at the National Physical Laboratory are described, including references to foreign work on the subject. In discussing results of tests on the buffeting in the wake of an airfoil of infinite aspect ratio, the author describes in detail the N.P.L. apparatus, and shows that in this case buffeting is only severe for incidences at or above the stalling angle when the airflow has "broken down." He devotes part of the article to tests on buffeting in the wake of a wing-body combination. He concludes that from both flight tests and model experiments there is evidence that sideslip may notably increase the severity of tail buffeting. Both types of test agree in showing that the effect of the slipstream from the propeller is usually to reduce the buffeting quite substantially. Reflexing the trailing edge of the wings near the fuselage had little beneficial effect and may even be detrimental.

Aerodynamics

The Calculation of Potential of Velocities in Hydrodynamics (Sur le calcul du potentiel des vitesses en hydrodynamique), F. Vasilesco. Publications Scientifiques et Techniques du Ministère de L'Air, Service des Recherches de L'Aéronautique, No. 29, 1933, 31 pp.

THE BASIS of the report is a paper presented at the Congress of Applied Mechanics at Stockholm by Riabouchinsky in which he reviewed a method, developed in the courses of his research on cavitations, for expressing the potential of velocities by means of given data. The author of the present report goes into the existence of all the derivations which enter into the formulas previously given and determines how they may be calculated. The development being absolutely and uniformly converging represents a harmonic function which he verifies. He takes the case of a sphere of any radius and uses a development in spherical functions.

Seaplane Design

Seaplane Research, H. M. Garner. Royal Aeronautical Society Journal, Vol. 37, No. 274, October, 1933, pp. 830-855 and (discussion) 855-863, 20 figs.

WORK WHICH has been done in recent years on three of the most important problems associated with seaplanes is discussed, including the reduction of resistance, the elimination of instability, and the formulation of structure loads, while the direction in which research on these problems is proceeding, is pointed out. In taking up the measurement of water resistance of hulls and floats, the author compares the M. A. E. E. and DVL methods and describes an indirect scheme for determining the full-scale resistance of a large flying boat. He goes into the problems of static and dynamic stability and seaworthiness, suggesting further research. He shows how water loads which are applied to the structure of the hull may be determined and describes the DVL pressure recorder and other apparatus used.

Engine Cooling

Engine-Cooling Research, R. McKinnon Wood. Royal Aeronautical Society Journal, Vol. 37, No. 273, September, 1933, pp. 733-744 and (discussion) 744-755, 4 figs.

RESULTS OF research in airplane engine cooling, undertaken at the Royal Aircraft Establishment for the British Air Ministry, are described by one of the leading British experts in aerodynamics. Two separate ideas are involved; first, the jacketed engine with carefully streamlined passages, and second, the introduction of a fan, either as an auxiliary or to give the sole motive force. It was not proved that fan induction was more efficient than flight induction for the rate of flow required, but a strong case could be made for the fan as a means of giving more cooling, if flight induction failed, as an easy means of adjusting the cooling, and, most important, as providing a large measure of automatic regulation with flight speed which has an important influence on the top speed.

Lubricating Oils

Research on the Dispersion of Castor Oil and Various Glycerines on the Surface of the Water (Recherches sur l'étalement de l'huile de recin et de divers glycérides a la surface de l'eau), C. Bouhet and R. Lafont. Publications Scientifique et Techniques du Ministère de L'Air, Service des Recherches de L'Aéronautique, No. 33, 1933, 46 pp., 31 figs.

A METHOD for studying glycerines is described which was based on their extension on the surface of the water. Apparatus was constructed by means of which surface tensions from 0.001 to 60 dynes per cm. could be accurately measured. In examining saturated films in the presence of excessively fat bodies, the authors found that with oleic acid a slow variation of surface tension with time was obtained after expansion or compression, while with castor oil, the variations of form of excess oil were much more important and lasted much longer. The delay produced in establishing the equilibrium of the coating of oil on the wall of the apparatus was due to a viscosity in two dimensions and was very great for castor oil. The authors consider that this should play a very important part in all questions relating to lubricants.

They show that for films of castor oil there exists an angular point corresponding to a passage of the saturated film to a non-saturated film, and deduce the coordinates of that point and the mean molecular dimensions of fat bodies. They determined that there was a considerable increase of area when passing from oleic acid to castor oil, but a decrease in area when passing from fresh castor oil to artificially-aged castor oil. These molecular dimensions appear intimately connected with the value of the lubricating properties.

Flight Tests of a New Tunnel Type Engine Cowl

DR. MICHAEL WATTER
Consulting Aeronautical Engineer

● The constant demand and obvious need for higher performance in modern aircraft has resulted in the almost universal adoption of fairings, fillets, wheel streamlines and other means intended to reduce interference and decrease resistance. For radial air-cooled engine installations in the United States it is almost universal practice to use the NACA full cowl, Townend ring or some compromise arrangement indicated by actual tests to be preferable.

Because of the writer's long experience in the design of airplanes powered with air-cooled engines, first news of the beneficial effects of rings and cowls caused him to investigate this new source of possible refinement of a design. Actual use of full NACA cowls and Townend rings showed the sensitivity of the adoption of a suitable cowl to a given fuselage and a definite lack of improvement in climbing ability of the airplane, despite the gain in speed. This was the impetus for a critical study of the working of the ring type cowls and the resulting invention of the tunnel cowl. The purpose of this article is to give a general description of this cowl as well as the results obtained with it in a series of test flights.

In connection with the development and testing of this cowl, the writer takes this opportunity of expressing his gratitude to General Juan F. Azcarate, Chief of the Presidential General Staff, and General Leobardo C. Ruiz, Chief of the Department of Aeronautics of the Republic of Mexico, who, during the time the author was engaged in consulting services with private interests in Mexico City, placed at his disposal two Vought Corsairs, and all the facilities, pilots and other personnel of the Government aircraft factory.

Principles of the Tunnel Cowl

Literature on the subject of ring cowls is quite extensive and in addition to academic reports on laboratory experiments conducted here and abroad, there is a great deal of information on actual installations published in papers at various times by engineers and designers. The author's practical experience is in good quantitive agreement with data given by Paul M. Boyd in his paper, *Engine Cowl Rings* read at the Aeronautic Meeting of the A. S. M. E., May 12 to 14, 1932.

The basic difference between the tunnel cowl and ring type cowl is that the airflow in the former is controlled not only radially, but, as referred to individual cylinders, laterally as well, thus directing and guiding the air completely around each cylinder and the engine as a whole.

The crew which conducted tests of the Watter tunnel cowl: Dr. M. Watter, Lt. A. Hermosillo, Lt. B. Hermosillo and Ing. J. Brelivet.

Figures 1 and 2 show the Townend ring and NACA full cowl, indicating the radial restriction they impose on the airflow. The theoretical explanation of the working of these cowls is somewhat involved, but fundamentally consists of preventing the formation of turbulent regions in a radial direction, and, by virtue of venturi effect, blowing away such turbulences formed at the rear of the intercylinder space, the whole effect resulting in a smoother and faster flow around the fuselage. The inter-cylinder interferences and turbulences at the rear of the cylinder caused by the airflow around the individual cylinders is, however, but slightly affected and it is this source of resistance and insufficient cooling (combated by baffles) which led to the conception of the tunnel cowl.

In the case of the tunnel cowl, the engine is completely enclosed within a streamline form, and only a definite quantity of air is admitted through the main front openings to each of the cylinders. (See figure 3.) Once the air enters the opening it is guided around the cylinders by means of individual tunnels, the restriction being complete in three directions. The distance between the walls of the tunnel widens to its maximum at the cylinder and then converges to terminate in a point, the walls and side cutout forming a triangular opening for exhausting the cooling air. This shape, while possibly not the best from the aerodynamic point of view, is considered desirable for proper cooling, since the airflow is thus directed around the rear of the cylinder head to be afterward expelled by virtue of the higher velocity created in the tunnel, without the need for additional baffles.

The higher aerodynamic efficiency of the tunnel cowl is due to the following facts:

(1) The portion of the airflow not utilized to cool the engine is guided over an uninterrupted smooth streamline form of the portion of the cowl not containing cylinder openings.

(2) Cylinder interference is absent.

(3) Cylinder resistance is reduced.

Cooling of the crankcase is achieved by means of the usual small front openings provided with a shutter control, the air thus admitted being expelled through a circular opening formed by the cowl shell and the body.

The simple exhaust system consists of individual bayonet-type stacks located in the side air outlet openings and protruding only one quarter of an inch beyond the line of cowl.

The constructional problems of the tunnel cowl presented no difficulties, as the unit consists of an outside shell with appropriate openings, and individual tunnels composed of two parts joined at the center for ease of assembly. In the experimental installation shown in the accompanying photographs the outer shell was made of three parts—the front face plate with air entrance openings, the ring, and the side cowls with air outlet openings. The entire assembly weight was but 40 pounds, which is equal to (or possibly slightly less than) the weight of a standard cowl and Townend ring, and is decidedly lighter than an NACA cowl installation. Installation of the tunnel cowl was made in a way to facilitate easy servicing and inspection of the engine. The photographs show the first tunnel cowl installed on the 02U-4 series Corsair No. 60 of the Second Aircraft Regiment, Mexican Air Corps.

Flight Tests

The first flight test of Corsair 60 equipped with the tunnel cowl was made in Mexico City on October 16 by Capt. Cristiani, pilot, with the author as observer, to determine the general behavior of the plane, oil temperatures, and to obtain qualitative comparison with another Corsair equipped with a standard cowl.

For the latter purpose, a standard Corsair (No. 42), piloted by Armando Hermosillo with Observer Ing. J. Brelivet, was flown alongside of Corsair 60, both engines turning at the same r.p.m. The day was clear and hot, the air temperature reaching 83°. The flight lasted 40 minutes, the engines in both planes turning up at 1600, 1700, 1800 and 2000 r.p.m.

The improved speed and climbing ability of the airplane equipped with the tunnel cowl were definitely established, and upon landing the pilot reported a definite improvement of the airplane's gliding ability as well.

The following oil temperatures were observed on Corsair 60: at 1600 r.p.m., 55°; 1700 r.p.m., 67°; 1800 r.p.m., 73°; 2000 r.p.m., 87°.

On the standard installation Lt. Hermosillo reported the oil temperature at 1900 r.p.m. as 72°.

To determine quantitatively the differences in speed of the two airplanes, a second flight was made on October 21. Corsair 60 was flown by the same crew as on the test flight, while Corsair 42, piloted by Lt. Hermosillo, carried as observer one of the pilots of the Second Regiment.

The speed trials were conducted over a straight course of 2 kilometers, the ships being flown over the course 5 times in each direction.

Taking the average of two best flights in each direction, the results obtained were:

Corsair 42, maximum speed 134 m.p.h., Corsair 60, maximum speed 149 m.p.m., a net gain of 15 m.p.h. due to the tunnel cowl. The total time of this test was about 30 minutes, and the temperatures observed were 83° for Corsair 60 and 70° for Corsair 42.

In order to determine the effect of the cowl on the behavior of the airplane at sea level it was decided to make a series of tests at Vera Cruz, and for this purpose two ships were dispatched to that city—the one equipped with the tunnel cowl and Corsair No. 61, with a standard installation. Below are given brief extracts from the logs of the flights to and from Vera Cruz:

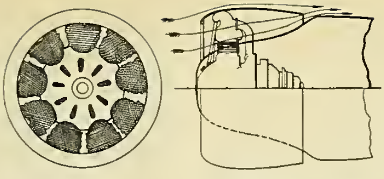


FIGURE 1. N.A.C.A. COWL

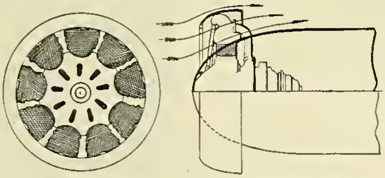


FIGURE 2. TOWNEND RING

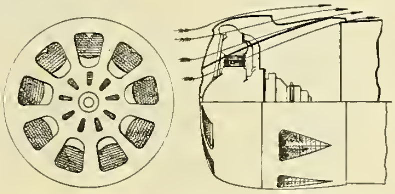


FIGURE 3. WATTER TUNNEL COWL

Corsair 60. Mexico, D. F. to Vera Cruz, 200 miles. Oct. 24, 1933, Lt. A. Hermosillo, pilot. Michael Watter, observer. Weather, partly cloudy; moderate North wind. Take off 11:19 A. M. Indicated average speed, first hour, 90 m.p.h. Maximum altitude reached, 16,100 feet. Passed over Tejeria Airdrome 1:15 P. M. Time of run, 1 hour 56 minutes. Kept altitude most of the way. Engine r.p.m., 1750. Oil temperature 70°. For a short interval of climb the temperature rose to 73°.

Return from Vera Cruz to Mexico, D. F., Oct. 25. Weather, scattered clouds, slight North wind. Take off 10:43 A. M. Circled Vera Cruz, passed Tejeria 10:53 A. M. Wide open from Tejeria to Soledad de Doblado (16.75 miles). Oil temperature 89°. Time, 6 minutes 34.2 seconds. Speed 153 m.p.h. Cruising speed, Soledad to Mexico, D. F., 100 m.p.h. Passed Military Airdrome, Mexico, 12:30 P.M. Time of run, 1 hour 37 minutes. Maximum altitude of flight, 13,500 feet. Average speed indicated 100 m.p.h. at 1750 r.p.m. Oil temperature, 70°.

Corsair 61, Mexico, D. F., to Vera Cruz. Oct. 24. Lt. Bernardo Hermosillo, pilot. Ing. J. Brelivet, observer. Take off 11:17 A. M. Engine r.p.m., 1700 to 1800 (r.p.m. increased in order to reach the necessary altitude for crossing mountain range). Indicated speed, 93 to 75 m.p.h. Maximum altitude reached, 13,400 feet. Temperature, 65° to 72°. Arrived at Tejeria 1:23 P. M. Time of run, 2 hours 6 minutes.

Return from Vera Cruz to Mexico, D. F. Oct. 25. Left Tejeria 10:34 A.M. Engine wide open (2000 r.p.m.) from Tejeria to Soledad de Doblado. Oil temperature, 65°. Time of run, 7 minutes 22.2 seconds. Speed, 137 m.p.h. Cruising speed, Soledad to Mexico, D. F., 93 to 75 m.p.h. Engine r.p.m., 1700 to 1800. Maximum altitude of flight, 13,100 feet. Temperature in climbing, 67°. Temperature during horizontal flight, 55° to 60°. Arrived Mexico, 12:28 P. M. Time of run between Tejeria and Mexico, D. F., 1 hour 54 minutes.

Upon landing in Tejeria, and after a short rest, speed trials were conducted with both planes, using methods identical with those used during the tests in Mexico City. For this purpose a 2-kilometer distance along the Mexico-Vera Cruz railroad line was utilized as a speed course over which the airplanes were flown 4 times in each direction. Taking the best average of two runs in each direction the results were:

Corsair 61, maximum speed 131.5 m.p.h. Corsair 60, maximum speed 148.5 m.p.h., a net gain of 17 m.p.h. The drop in speed of both planes is explained by the fact that a strong side wind was blowing across the speed course, making the flight extremely uncomfortable.

On the morning of Oct. 25 the two ships were flown wide open for about 25 minutes and the oil temperatures reported by the pilot, who flew first one plane and then the other were 69° for Corsair 60 and 56° for Corsair 61.

As a further check on the gain in maximum speed resulting from the use of the tunnel cowl it was decided on the return

Structural details and installation of the Watter tunnel cowl on a standard Vought Corsair

trip to Mexico City to fly wide open between the Vera Cruz Airport of Tejeria to Soledad de Doblado, a distance of 16.75 miles.

The results given in the flight logs give for Corsair 60 a speed of 153 m.p.h., while for Corsair 61 the speed was 137 m.p.h., indicating a net gain, due to the new cowl, of 16 m.p.h. Temperatures observed were 89° for Corsair 60 and 65° for Corsair 61. In connection with this test it must be pointed out that the latter ship took off with an oil temperature of 55° and immediately proceeded with the speed test, while Corsair 60 flew over Vera Cruz for 10 minutes at 1800 r.p.m., before proceeding with the test.

Flight Test Results

The flight tests completed up to the time of this writing consistently indicate an increase of about 16 miles per hour in speed due to the installation of the tunnel cowl on a ship which formerly had a maximum speed of 140 m.p.h. Admitting that part of this increase may be due to incidental refinements which resulted from the installation of the new cowl, a fair assumption is that the gain in maximum speed is not less than 12 to 14 miles per hour. From a comparison with the gains obtained by the use of cowl rings, the author's own experience, and as given in figure 11, page 101 of *Aeronautical Engineering* (Vol. 4, No. 3, Transactions of A. S. M. E.), it is evident that the increase in speed resulting from the use of the tunnel cowl is from 2.5 to 3 times greater than the increase resulting from the use of the cowl ring.

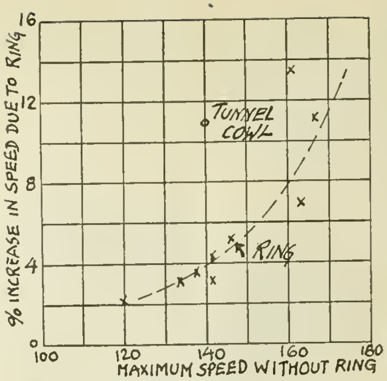
The utilization of the tunnel cowl, on an airplane of the type used in the tests, resulted in an improvement of performance equal to that obtainable in a ship with standard cowl installation by increasing the engine power by 33%.

Oil Temperatures

If comparison is made for the conditions when both test planes flew equal lengths of time, it appears that in level flight there is a constant difference in oil temperature of from 10° to 13°, which is small, and results in the operating temperatures at any altitude being well within safe operating limits.

In this connection, inquiries were made as to the operating temperatures of the tri-motors operated by Cia. Mexicana de Aviacion, S. A., between Minatitlan and Tejeria, on which the average time of run is about 2 hours. The engines are equipped with ring cowls and the average oil temperature given in the pilots' reports is 70° at 1700 r.p.m., at times, however, reaching as high as 91° at that r.p.m. without any apparent trouble.

The rise in temperature of an uncowled engine in climb is more rapid than for the engine enclosed in the tunnel cowl, so that in this respect, also, the latter possesses characteristics superior to ring type cowls.



Comparison of gains in speed obtained by the use of cowl rings

The improvement in climb and gliding ability still further increases the value of the tunnel cowl for airplanes with radial air-cooled engines.

Conclusions

The author hopes that his invention and the results obtained with it will find confirmation in more extensive tests—his own as well as by those who are impressed with the increases in performance obtained thus far. If further tests should substantiate the results obtained in the author's tests he will feel compensated for his efforts to contribute to the advancement of aeronautical knowledge.

Recent Patents

The following patents of interest to readers of AERO DIGEST recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

●

Spinner for aircraft propellers. Francis T. Courtney, Great Neck, N. Y. (1,927,921.)

Automatic steersman. Hyde A. Harman, U. S. Navy. (1,927,935.)

Aircraft training device. William E. Huffman, Dayton, Ohio. (1,927,938.)

Lifting air screw for air vehicles. Lt. Comm. Sidney P. Vaughn, Supply Corps, U. S. Navy. (1,927,966.)

Airplane. Nicholas Rippen, New York, N. Y. (1,928,317.)

Airplane with four axially arranged engines. Raymond Bratu, Paris, France. (1,928,326.)

Folding-wing plane. James H. Kindleberger, Los Angeles, Calif., assignor to Douglas Aircraft Co., Santa Monica, Calif. (1,928,336.)

Landing gear for aircraft. Frank S. Wigley, Barnes, and Leonard F. Austing, Bromley, England. (1,928,471.)

Airplane maneuvering apparatus. Joseph Weisinger, Newark, N. J. (1,928,519.)

Safety device for heavier-than-air machines. Thomas A. Davis, Windsor, Ont., Canada. (1,928,560.)

Aircraft. Stanley H. Turrell, Glendale, Calif. (1,928,578.)

Flying machine landing gear. Albert F. Hickman, Eden, N. Y., assignor to Hickman Pneumatic Seat Co. (1,928,651.)

Clamping device for tapered propeller blades. James H. McKee, Pittsburgh, Pa., assignor to Pittsburgh Screw & Bolt Corp. (1,928,818.)

Airplane wheel. Ira M. Coppock, Dayton, Ohio, assignor to Variety Mfg. Co. (1,928,882.)

Aircraft. George F. Myers, Jackson Heights, N. Y. (1,928,980.)

Parachute safety device. Waid G. Rolkerr, Oakland, Calif. (1,929,005.)

Device for longitudinal control of airplanes. Ercole T. D. Floresta, Vigna di Valle (Roma), Italy. (1,929,061.)

Parachute attachment for airships. Ignazio J. Scalisi, Albany, N. Y. (1,929,120.)

Control surface for airplanes. Giuseppe M. Bellanca, New Castle, Del. (1,929,135.)

Airplane. John K. Northrop, Burbank, Calif., assignor to Stearman Aircraft Co., Wichita, Kans. (1,929,255.)

Variable pitch and reversible propeller. James H. McCloough, San Jose, Cal. (1,929,435 and 1,929,436)

Construction and control of aircraft having air-actuated sustaining means. Joseph S. Pecker, Philadelphia, Pa., assignor to Autogiro Co. (1,929,512)

Floating harbor for amphibions, flying boats, and seaplanes. Edward W. McVitty, Salem, Va. (1,933,597)

Propelling means (aeronautical). Albert L. Widdis, Harrisville, Mich. (1,933,883)

Parachute and parachute-launching means. Nick P. Softis, St. Louis, Mo. (1,934,382)

Airplane flying teaching apparatus. Morton J. Helper, Shaker Heights, Ohio. (1,934,464)

Portable flood-light unit for airports. Cleal T. Watts, Chicago, Ill. (1,934,576)

Propeller. Clinton H. Havill, South Orange, N. J., assignor to Bendix Research Corp. (1,934,668)

Airplane motor mounting. Guiseppe M. Bellanca, New Castle, Del. (1,934,678)

Retractable landing gear. Gabriel Midboe, Brooklyn, N. Y., assignor to General Aviation Mfg. Corp. (1,934,992)

Hydraulic airplane control. S. P. Winther, Jr., New York, N. Y. (1,935,004)

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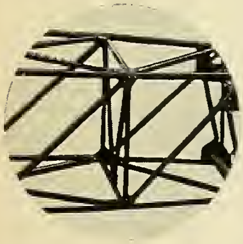

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Fokker F.XX Transport

● The Fokker F.XX produced by N. V. Nederlandsche Vliegtuigen Fabriek, Amsterdam, Holland and designed to carry 12 passengers, two pilots and a radio-operator-mechanic, is a three-engined cantilever monoplane, the more prominent features of which are a retractable undercarriage and tail wheel.

In the construction of the wings, the designers have developed some notable building practices and have incorporated flaps between the fuselage and ailerons to reduce landing speeds.

The wing is constructed with two box spars having spruce flanges and plywood webs; ribs are of plywood with ash nose flanges and the entire wing is covered with plywood and secured to the fuselage framework by four bolts. Covering on the under surface of the wing is eliminated from the center section, and the space thus gained forms the upper part of the cabin. The deep wing section facilitates provision of luggage compartments in the wing.

Fuel tanks are installed inside the wing on either side of the fuselage. Between the tanks and the wing tips are luggage holds to which access is gained through doorways in the under surface of the wing. Smaller lockers to the left and right of the fuselage above the windows (within the wing) are accessible from the cabin and may be used for baggage.

Conduits for the lighting system, bonding for the radio, control mechanism for the outboard engines, and cables and rods for operating the ailerons, wing flaps and the retractable undercarriage are all contained in the wing, which in addition, mounts fittings for hoisting purposes.

Power Plant

Three Wright Cyclone R. 1820-F engines, each developing 640 h. p. at 1900 r. p. m., and 427 h. p.. at 1650 r. p. m. (cruising speed) are used. Each engine, at maximum r. p. m.. consumes fuel at the rate of 353 pounds per hour.

The two outboard engines, suspended in nacelles, are secured to the wing at three points. The covering behind these engines and the lower surface of the fuselage to the rear of the center engine is of sheet elektron, while the remainder of the fuselage and the after parts of the outboard engine nacelles are fabric covered.

Engine equipment includes Hamilton Standard adjustable pitch metal propellers and Eclipse electric starters.

Fuel and Oil System

Installed in the wing between the two spars are four welded sheet aluminum fuel tanks, each with a capactiy of 143 Imperial gallons or a total of 572 Imp. gallons. Fuel flows through a conduit fitted with a tap to a distributing valve mounted on the front spar of the wing behind the pilots. The carburetors are fed by means of engine pumps, and a hand pump with a four-way valve is fitted to the distributing valve. This pump primarily is used for starting the engines, but may be used in case of engine pump failure. Attached to the distributing valve is a filler pipe, leading out through the right side of the fuselage, about five feet above the ground before the door of the luggage compartment. By means of this pipe, it is possible to fill the tanks in about 30 minutes and eliminate the necessity of having any one climb on the wing. In cases of emergency, it may be used to jettison the fuel. Four electric gauges, mounted on the control panel, indicate the quantity of fuel in the tanks.

Welded elektron oil tanks, each with a capacity of 16.5 Imp. gallons (including an allowance of 1.8 Imp. gallons for foaming) are behind each engine.

Fuselage

The fuselage, following standard Fokker principles, is constructed with a framework of seamless cold drawn tubes installed transversely through the construction. The section of the fuselage is elliptical and provision has been made for supporting the fuselage when the machine is on the ground without resting on the undercarriage. For lifting the rear of the plane, steel tubes are installed transversely through the fuselage, through which tubes of smaller gauge may be inserted.

Behind the center engine a small luggage space is separated from the engine by a fire-proof wall of aluminum.

The pilot's compartment is before the wing and entirely enclosed. Side windows are of the sliding type, sufficiently large to serve as emergency exits. Two windows of domed Cellon are provided in the foward part of the cabin ceiling.

Pilots' chairs are spacious and comfortable. Seats and backs are of cane to ensure coolness and ventilation in tropical climates. By means of a lever, seats may be tiltered forward or backward or moved horizontally, providing the pilots with easy and, if desired, frequent changes in their sitting positions during long flights.

To the left of the first pilot is a handwheel for operating the wing-flaps; to the right a wheel for adjustment of the stabilizer.

Within easy reach of both pilots is.a knob, which, when pulled out, neutralizes the entire electric installation so that the danger of fire from this source can be eliminated in the event of a forced landing.

The cockpit can be ventilated at will and electric windshield wipers are installed on the two front windows.

Behind the pilots is the radio compartment and in the floor on the left side is an aperture for the driftmeter. The radio set is suspended in a frame on the right wall; above it is the switchboard containing all the instruments for engine control.

The Cabin

Behind the cockpit and instrument compartment, separated by a sliding door, is the cabin with accomodations for 12 passengers. The chairs are arranged in two rows of six with an aisle between. In the fore part of the cabin (between the wing spars) accomodations are provided for four passengers; in the rear part are accomodations for eight passengers and on either side a spacious compartment for luggage is in the wing behind the rear spar.

Windows are unusually large. The panes in front and rear windows are of glass which in cases of emergency can be quickly smashed by means of a mechanical device without danger of splinters.

Two trap doors are provided as emergency exits in the center section of the wing.

Windows cannot be opened, but the ventilating system can be controlled by the passengers to regulate the fresh air supply. The cabin is heated by hot air led through floor gratings.

At the rear of the cabin is a lavatory with a sliding communicating door, while to the rear of the lavatory is the luggage compartment which may be entered from outside the plane by a door on the right side.

Control Surfaces and Steering Gear

Ailerons are of wood construction. They pivot on spindles set a short distance from the leading edges, are compensated by weights in the wing and are therefore statically and aerodynamically balanced. They are operated by means of rods set in ball bearings and by cables led over pulleys.

The tail surfaces are made up of a framework of welded steel tubes and are fabric covered. Rudder and elevators are of the balanced type, i.e., the axes of rotation are behind the leading edges.

The stabilizer may be adjusted by the pilot during flight. The fixed fin is welded on the fuselage. By means of a compensating device on the rudder bar, it is unnecessary for the pilot to exert pressure on one side of the rudder bar when flying with one of the outboard engines stopped.

Landing Gear

The undercarriage can be entirely drawn into the outboard engine nacelles. The shock absorbers consist of two struts on either side of the wheel held at the top by an elektron casting and at the bottom by the wheel axle. The struts are supported at the rear by a framework of steel tubes.

The undercarriage is lowered or drawn in mechanically by means of a hand-wheel. Signal lamps on the instrument panel in front of the pilot correspond to the various positions in which it is possible to lock the undercarriage. The tail wheel, fitted with a low pressure type tire, is completely retractable.

Instruments and Equipment

The following instruments are installed in the F.XX as supplied to the K.L.M. airline. On the instrument panel in front of the pilots: artificial horizon; course indicator (2) and setter for the distance reading compass; directional gyro; electric tachometer (3); chronometer; altimeter 0-1000 meters with barometrical scale; altimeter, 0-6000 meters; rate-of-climb indicator; low-pressure indicator for the artificial horizon; longitudinal inclinometer; 14 signal lamps to indicate position of undercarriage; outboard thermometer; pressure gauge for brakes; speedometer; starter buttons with switch for hand or electric starter (3); priming pump with 3 valves; magneto switch (3) and an aperiodic master compass.

On the instrument panel behind the pilot: switches for lights, etc.; oil pressure gauge (3); oil thermometer (3); fuel pressure gauge (3); thermometers for cylinder temperature (3) and electric fuel gauge (4).

Below this panel is the radio set.

On the wing spar behind the pilots: fuel valves and distributor; hand-wheel for raising and lowering undercarriage and undercarriage locking device.

Port nacelle of the Fokker F.XX

Behind the luggage hold in the fuselage is a distant-reading compass.

A signalling light and a landing light are installed under the radio room. Electrical current is supplied by two 12-volt, 57-ampere batteries, while generators are driven by the center and right hand outboard engines.

Performances

The following performances are guaranteed by the manufacturer to be within 1½% in the weight empty; 3% in the speeds, and 6% in the climbs, with engines developing the power stated.

The useful load may be divided as follows:

(a) Working load: Crew (3), 530 pounds; fuel and oil for 400 miles, 1850 pounds.

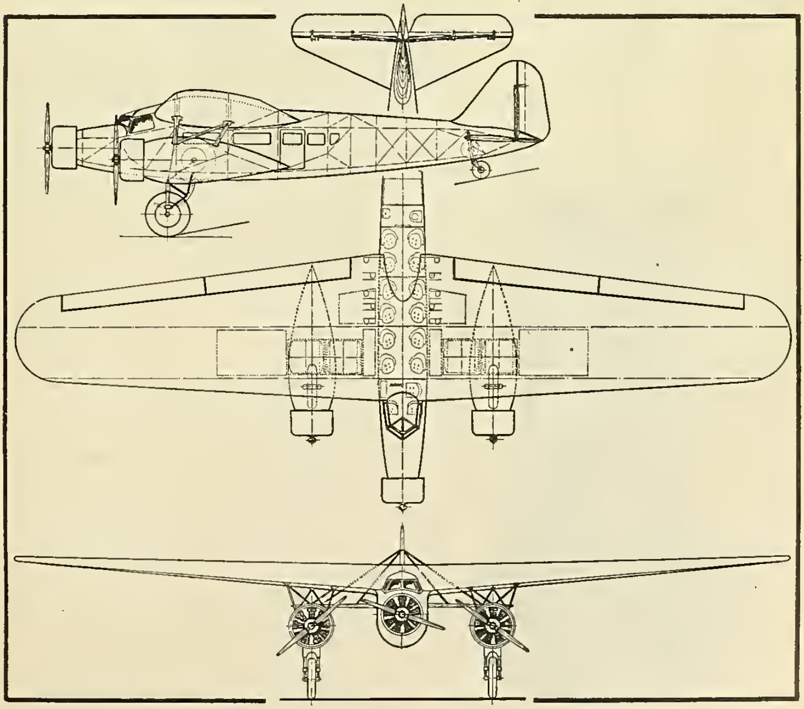
(b) Equipment: Cabin (12 chairs), lavatory, electrical equipment, radio, sound proofing and miscellaneous, 1,100 pounds.

(c) Pay load, 4,235 pounds.

If a range of 750 miles is required, the weight of the fuel and oil carriel is 3,428 pounds; in this case, the permissible weight for pay load is 2,650 pounds.

Specifications

Wing span	90 feet 2 inches
Length	54 feet 9 inches
Height	15 feet 7 inches
Wing area	1033 square feet
Wheel track	19 feet 8 inches
Cabin length	16 feet 1 inch
Cabin width	5 feet 1 inch
Average height of cabin	6 feet 3 inches
Cabin capacity	406 cubic feet
Luggage capacity	235 cubic feet
Fuel capacity	572 Imperial gallons
Weight empty	12,122 pounds
Useful load	7,715 pounds
Total weight	19,837 pounds
Wing loading	19.25 pounds per sq. ft.
Power loading	10.25 pounds per h.p.
Maximum speed	186 miles per hour
Cruising speed	154 miles per hour
Minimum horizontal speed	64 miles per hour
Landing speed	59 miles per hour
Climb to 3,300 feet	4 minutes
Climb to 6,600 feet	9 minutes
Climb to 9,900 feet	15.5 minutes
Climb to 13,000 feet	25.3 minutes
Service ceiling (17,600 lbs. wt.)	20,000 feet
Service ceiling (19,837 lbs. wt.)	16,500 feet
Ceiling, 2 engines (17,600 lbs. wt.)	12,500 ft.
Ceiling, 2 engines (19,837 lbs. wt.)	9,200 ft.
Flight range	1,000 miles



Three-view outline drawings of the tri-motored Fokker F.XX transport

. NEW EQUIPMENT and METHODS .

Airless Electric Painting Device

• THE INTRODUCTION of a new electrical (airless) painting machine is another advance in the progress of mechanical painting. It is the Norris Electrical Painting Machine, a product of Electrical Painting Equipment Co., Inc., New York, N. Y.

This self-contained electrical unit (easily held in the hand) utilizes centrifugal force in applying the paint and other material, rather than the air pressure method.

Foremost in the characteristics of this machine is its ability to reduce maintenance and industrial costs and its rapid application of paint and enamels, etc., making it possible to complete a job many times faster than a brush. It accomplishes about 1500 square feet in an hour.

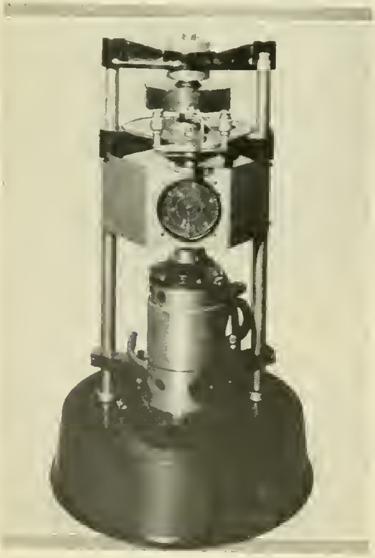
Paint is forced out in an even, fan-shaped spray, which, by adjustment of the distributor, may be varied from less than one to eighteen inches in width. The cut-off on all four sides can be held sharp at the option of the operator.

A paint control valve at the base of the machine regulates the consumption of paint to the necessary quantity.

Absence of paint fog or dirt is claimed.

Oil Quality Measuring Machine

• THE QUALITY of any oil, and its ability to adhere to and penetrate metal can be measured by a new machine known as the Sperry-Cammen tester, a development of the engineers of the Sinclair Refining Company in collaboration with the engineers of the Sperry Gyroscope Company, Brooklyn, N. Y.



Sperry-Cammen oil-quality tester

The machine subjects oils on bands of different materials to terrific centrifugal stresses by spinning the bands on rotors at from 6,000 to 22,000 r. p. m. ripping the non-adhesive parts of the oil from the metal and leaving the oilier parts to cling on. The behavior of the oil is then tested by photographing the oil drops, measuring their diameters to a fraction of a thousandth of an inch, weighing the rotors when the oil first was applied and then afterward with what oil has remained on them after the application of the centrifugal forces.

From a study of these results it can be determined in advance, in the laboratory, how an oil will behave as a lubricant under conditions of extreme cold or heat. The ability of the oil to adhere to and penetrate metal and to cling to it, is apparently the oil's lubricating ability or its "oiliness."

Portable Electric Grinder

• THE NEW high-speed portable electric tool announced by Chicago Wheel & Mfg. Co., Chicago, Ill., is for rough, off-hand grinding, for touching off parts, tools and dies, and for varied grinding and sharpening jobs.

The design of the Hand-ee Hi-Power Grinder is compact, well-balanced and light. With a suitable grinding wheel or cutter inserted in the chuck, it works at any angle, getting into and around corners, into irregular shaped holes and other hard-to-reach places. Grinding, polishing and cutting are accomplished with a minimum of time and labor.

Three grinding wheels are furnished, and over 100 shapes and sizes of grinding wheels are available to meet practically every need, thus providing a multiple-service tool.

A universal motor supplies the power; the tool has a maximum speed of 17,000 r.p.m. and may be plugged in on either alternating or direct current, 110-volts. High-speed, dust-sealed ball bearings reduce friction, eliminate over-heating and assure maximum power delivery.

The motor housing is of heavy cast aluminum, extending out over the motor shaft, this portion encased with a fully insulated, cushion grip.

Furnished as standard equipment, are a dressing stone, necessary wrenches and a 10-foot rubber-covered cable with soft rubber attachment plug, all in a compartment box container.

Hydro-Mechanical Squeeze Riveter

• A MECHANICAL squeeze riveter with arrangement for automatic feeding of rivets is offered by Norin Engineering Co., Chicago, Ill.

Rivets are fed from a hopper to a pair of rivet-receiving fingers, mounted around the upper die, which is fastened to the plunger. These fingers hold the rivet in position under the upper die during the riveting stroke. The lower die is made in two parts: a work-locating pin and a main die. The locating pin protrudes above the lower die surface, enabling the work to be correctly located before riveting, and is pushed down by the rivet itself until the pin is stopped at a predetermined height in which position it forms a part of the lower die.

Riveter mechanism is of the hydro-mechanical type which has complete and unlimited flexibility. A long uniform pressure stroke, usually one-third of the length of plunger stroke, allows rivets to be driven in different thicknesses of material without changing dies or making adjustment. The tonnage may be adjusted at will.

Portable Generators

• AN INTERESTING development in the field of electric generating units recently perfected by the Harnischfeger Corp., Milwaukee, Wis., is found in a line of portable lighting plants, featuring high reserve capacity, economical operation, simplified design and continuous non-flickering current.

The small, heavy-duty line consists of a one- or two-cylinder gasoline engine directly coupled to a compound wound, continuous generator. Push button or manual starting is available.

Capacities range from 400 watts to 3 kw. generating 35 or 120 volts direct current. Greater capacities are provided for by four and six-cylinder gasoline generator sets with a current range of 1½ to 60 kw.

High-speed portable electric grinder

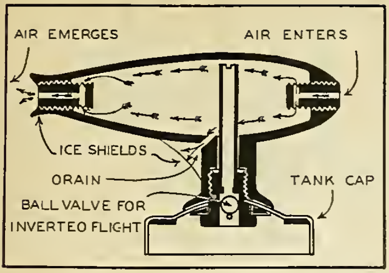


Diagram of Ecrun fuel tank vent set for normal pressure

Fuel Tank Vent

• HIGH WING dual fuel tanks do not feed fuel to the carburetor at equal rates of flow, and when tanks are full they are also inclined to spray fuel from the vents. This is due to different pressures (caused by slipstream rotation) existing within the several tanks. Air and vapor locks are created by negative pressures, for when one tank becomes empty before another, air may be drawn into the lines. Negative pressure prolongs this condition.

The Ecrun vent designed to meet these difficulties, neutralizes the pressures, for since the pressures are caused by velocity, reduction of the velocity of air past the inner vent reduces the pressure effects. On a craft of average speed the pressure effects are equal to a variation of more than 12 inches of fuel head, and since the pressures may be positive or negative, the difference between the extreme conditions is actually twice that number of inches. A vent open to direct impact pressure admits rain and dust and is liable to "gang up." A vent open toward the rear produces negative pressures, and is liable to eject fuel from full tanks.

The Ecrun vent may be set to give neutral or positive pressures in the tank. Fuselage tank installations are also improved by proper venting since insufficient head pressure due to low tanks is a possible cause of engine failure.

The low pressure is reduced in effectiveness by negative pressure in the tanks. Investigations have shown that the negative pressures can be much greater than the positive pressures produced by direct impact. In such cases the Ecrun vent substitutes positive pressure for negative pressure with marked improvement in the fuel flow even with a nearly empty tank, the pressure difference being equivalent to raising the tanks one and a half to three feet higher. Higher pressures tend to eliminate air locks.

The Ecrun vent which is produced by E. Curran of Roosevelt Field, L. I., can be fitted to the ordinary tank cap and adjusted within a few minutes.

Evans Aircraft Fuel Pump

• AN AIRCRAFT fuel pump which, according to its manufacturers corrects four objections that have cut the operating efficiency and stability of pumps in the past, has been designed and perfected by Evans Appliance Co., Detroit, Mich., and will be placed on the market immediately following completion of present tests.

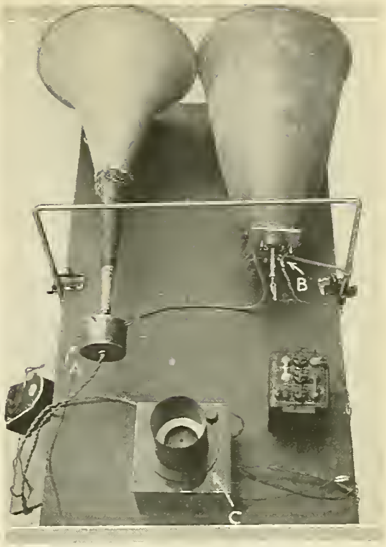
The pump, known as Model E-8 was perfected in the laboratories of the Evans company at the request of United States Navy officials. It features a shaft to eliminate breakage, a sylphon seal to seal the gasoline after the pump has been in long usage, and a suitable means in the pump itself to regulate the pressure to the carburetor. A fourth feature, according to the company, is that the pump can operate for 5,000 hours. By use of a sylphon seal, suction has no effect on pressure, allowing a constant pressure at all times.

The flexible shaft is obtained by inserting a small shaft in the main shaft, holding it in place, and yet allowing a flex of about 1/64 inch on all sides of the inner shaft. By this means, breakage through misalignment is said to be eliminated. The internal relief valve is an integral part of the pump and can be adjusted to any desired pressure, thus avoiding an external line as well as an external relief valve.

The pump itself is of heat-treated aluminum casting. Internal working parts are constructed of nitralloy steel, which according to the company, has exceptional wearing quality. The bearing of the pump is made of a high lead bronze bearing of special analysis to eliminate the possibility of shaft seizure. The E-8 is a compact unit weighing 2¼ pounds with a capacity of 280-300 pounds per hour, free flow, adequate enough to care for any aeronautical need, the Evans company states.

Slide Rule For Accuracy

• A QUICK slip stick check of figuring for engineers, pilots, mechanics, field men and students may be performed perfectly by the Indeco Slide Rule, designed and manufactured by the Industrial Engineering Co., Bridgeport, Conn. This instrument features light weight and indestructible construction. It is six inches long, with solid celluloid faces and is ingeniously assembled in a chromium plated metal back. Its cursor is of crystal clear non-breaking qualities. The instrument is accurately divided with scales A, B, C and D, allowing multiplication, division, squares and square roots.



Experimental acoustic altimeter showing (A) impulsive sound generator; (B) selective microphone; (C) altitude indicator

Acoustic Altimeter

• OPERATING SOMEWHAT after the principle of the depth indicators used in naval practice, a new acoustic altimeter, designed to add to safety in aerial transportation, has been completed by Leo P. Delsasso, Associate in Physics at the University of California.

To perfect the instrument, a new type of microphone had to be developed. Called a selective microphone, it records only one pitch of sound and despite the multiplicity of sounds and noises, it disdains all of them except the single sound pitch to which it has been attuned.

Knowing the noises in aircraft that he had to contend with, Delsasso worked on sounds not found therein, and selected tones which would blast through motor and wing noises, carry to the earth, echo back and be picked up by the microphone. A siren horn, specially tuned, is used to create the sound. Then came the development of the mechanism which would automatically "translate" into feet the number of seconds it took for the sound to travel to the ground and back. An indicator on a small dial mounted upon an instrument board and actuated by this mechanism, gives continually the altitude the airplane is from the ground.

The coordination of acoustical and mechanical principles and devices in this new instrument is the result of years of research. The present work is being carried on under a grant from the Guggenheim Foundation with the cooperation of the U. S. Navy, the Goodyear Tire & Rubber Co., and Western Air Express.

. AIRLINES and AIR TRAVEL .

Airline Buys Lockheeds

REPRESENTING THE initial phase of what officials of Northwest Airways, Inc., are calling the greatest development in the history of the company, a fleet of high-speed Lockheed Orion transports was ordered for delivery in December for the Spokane-Twin Cities division of the company.

The new planes, the latest 1933 models, were made to order for Northwest Airways and include, in addition to standard specifications, special features suggested by the operating department of the airline. Among these innovations are metal wing flaps, controllable pitch propellers, retractable landing gears and two-way radio equipment. Illustrating the design progress in the ship, is the replacement of the radio mast by a trailing wire antennae which gives an increased cruising speed of five miles an hour.

With the introduction of the new planes, Northwest Airways will inaugurate new high-speed schedules calling for a complete trip from Spokane to the Twin Cities in about seven and a half hours. Schedules between the Twin Cities and Chicago will be about two and a quarter hours. Both schedules will be coordinated with the present Chicago-New York schedules, making possible a Spokane-New York trip in a little more than 14 hours.

Airline Traffic Increases

FAVORABLE INCREASES in traffic over American airlines in all activities except air mail is seen in a report of the Aeronautical Chamber of Commerce for the first nine months of 1933.

The best gain was made by air express which showed 1,278,797 pounds for the first nine months of the year, compared with 1,019,973 pounds or 25.4 per cent more than the same period of 1932. Gasoline and oil consumption for the period under consideration showed 19,136,835 and 562,539 gallons respectively, each figure about 24.5 per cent greater than the 1932 amount.

There were 40,701,837 miles scheduled and 38,453,212 miles flown in the first nine months of 1933 while passengers carried totaled 415,323. In air mail, where a decrease of 6.6 per cent is noted, poundage carried totaled 5,578,402 to September 30, 1933, compared with 5,975,262 pounds for the similar period in 1932.

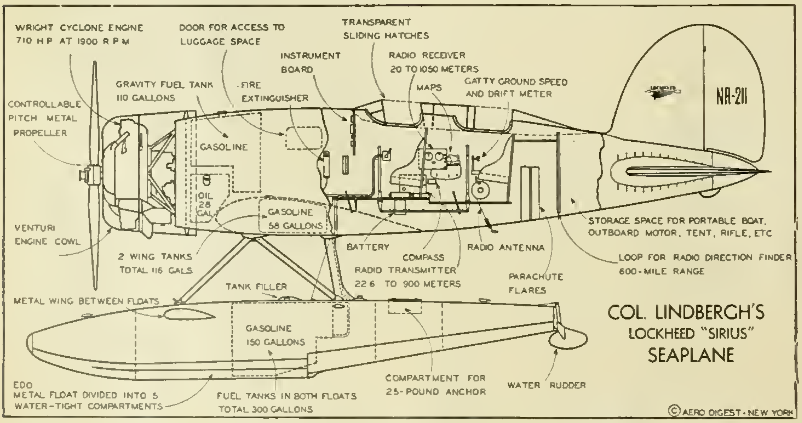
UNITED AT PHILADELPHIA

DAILY PASSENGER service out of Philadelphia to Cleveland, Chicago and Pacific Coast cities was inaugurated December 17 by United Air Lines giving the Quaker City its first tie-up with the airline company. The westbound schedule calls for a six-hour service between Camden Airport and the Chicago Municipal Airport.

Kohler Reduces Rates

FURTHER RATE reductions, in some instances approximating 65 per cent, are now in effect on the Milwaukee-Detroit run flown by Kohler Aviation Corp., Milwaukee, Wis. As an added inducement, air travelers receive a 15 per cent reduction on round-trips.

Until Spring, Kohler will conduct winter operations at the Milwaukee County Airport. In Detroit, operations are carried out at the City Airport.


WRIGHT CYCLONE ENGINE 710 H P AT 1900 R P M
DOOR FOR ACCESS TO LUGGAGE SPACE
TRANSPARENT SLIDING HATCHES
INSTRUMENT BOARD
RADIO RECEIVER 20 TO 1050 METERS
GRAVITY FUEL TANK 110 GALLONS
FIRE EXTINGUISHER
MAPS
GATTY GROUND SPEED AND DRIFT METER
NR-211
CONTROLLABLE PITCH METAL PROPELLER
GASOLINE
OIL 28 GAL
GASOLINE 58 GALLONS
STORAGE SPACE FOR PORTABLE BOAT, OUTBOARD MOTOR, TENT, RIFLE, ETC
VENTURI ENGINE COWL
BATTERY
COMPASS
RADIO ANTENNA
LOOP FOR RADIO DIRECTION FINDER 600-MILE RANGE
2 WING TANKS TOTAL 116 GALS
RADIO TRANSMITTER 22.6 TO 900 METERS
PARACHUTE FLARES
TANK FILLER
METAL WING BETWEEN FLOATS
COL. LINDBERGH'S LOCKHEED "SIRIUS" SEAPLANE
GASOLINE 150 GALLONS
EDO METAL FLOAT DIVIDED INTO 5 WATER-TIGHT COMPARTMENTS
FUEL TANKS IN BOTH FLOATS TOTAL 300 GALLONS
COMPARTMENT FOR 25-POUND ANCHOR
WATER RUDDER
© AERO DIGEST - NEW YORK

Arrangement of the plane in which Col. Lindbergh conducted his 30,000-mile survey of possible ocean routes to Europe for Pan American Airways

Braniff Three Years Old

THREE YEARS of continuous operation was marked by Braniff Airways, Inc., when employes celebrated the anniversary with an informal gathering at the Oklahoma City Golf and Country Club. Employes from Tulsa, Kansas City, St. Louis and Chicago attended the affair.

During the three years Braniff planes have carried 36,000 passengers and have flown about 3,050,000 miles, T. E. Braniff, president, said. Operations figures during this period show that more than 20,000,000 passenger miles were covered.

Under winter schedules recently put into effect, the Braniff line flies 2,940 miles daily between Oklahoma City, Tulsa, Kansas City, St. Louis and Chicago.

Eastern Air Extends Line

AIR SERVICE between Atlanta, Ga., and Warm Springs, Ga., was inaugurated by Eastern Air Transport with passengers, mail and express on a one round-trip schedule each day, the plane making connections at Atlanta for cities in the north and south.

Twin-engined Curtiss Kingbirds are flown on a 35-minute schedule between the two cities, which are 55 miles apart. The Warm Springs airport was enlarged and improved to accommodate either the Kingbirds or the Curtiss Condors which Eastern Air Transport is using on its other divisions.

Airlines Rent Salt Lake Depot

LEASES WERE approved on airport administration building rentals by the Salt Lake City commission to the Boeing Air Transport division of United Air Lines, National Parks Airways and Western Air Express. In addition to renting lobby space, Boeing also rented a section in the building for air mail use.

Rheinstrom New Traffic Head

PASSENGER, MAIL and express activities of American Airways are now being directed by Charles A. Rheinstrom, following his appointment as general traffic manager to succeed F. Warren Oakes, Jr., who resigned.

The new manager has been active in airline traffic work since 1928 when he became general traffic manager of Transamerican Airlines. He continued in this capacity until January, 1933, when the company became part of American Airways and since then has served as traffic manager for the company's eastern division and Chicago district.

(*Continued on following page*)

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are standard ignition equipment on every engine manufactured by The Pratt & Whitney Aircraft Co.

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(Continued from preceding page)

Tampa-Havana Line Operating

MORE THAN 7,000 persons gathered at Ballast Point Park in Tampa to witness the dedication of the new international air terminal there and to be present at the opening of a trial air service between Tampa and Havana by Pan American Airways.

Headed by Governor Sholtz, Mayor R. E. L. Chancey of Tampa and Dr. Jorge Trellis, Cuban Consul, the crowd came to inspect the terminal facilities and the Sikorsky S-40 with which Pan American inaugurated its three-hour service to Havana.

Tampa became the third North American terminal of Pan American Airways, the others being located at Miami and Brownsville, Tex.

The Tampa service, inaugurated as a result of the efforts of a number of local business men, including Jerome A. Waterman, president of Maas Brothers, Inc., a department store, is operating on a tri-weekly basis. In Havana it connects with Pan American's routes from Miami to 33 countries and colonies of the West Indies, Central and South America.

50,413 Fly in October

SCHEDULED AIR transport lines operating in continental United States carried 50,413 passengers in October, 1933, according to the Department of Commerce which received reports relative to operations from all of the 23 companies operating during the month.

The reporting lines flew 4,459,812 miles, carried 151,135 pounds of express and flew 19,356,220 passenger miles during the month.

Airline Personnel Appointed

WITH THE inauguration of its Spokane-Billings-Twin Cities line, over the Billings-Spokane extension, Northwest Airways has made numerous changes and appointments of personnel.

According to K. R. Ferguson, general traffic manager, A. G. Kinsman has been appointed West Coast Traffic Manager, Stewart F. Auer. Western Division Traffic Manager and C. A. DuRose, traffic representative. These men will maintain offices in and operate from Spokane.

Another appointment placed Francis La Fontise in charge of North Dakota traffic. He was transferred from Bismarck to Fargo, where he will maintain offices.

United Leases Airport

THE PENDLETON, Ore., airport has been leased to United Air Lines for a term of fifty years.

Following the completion of contemplated improvements by the company, the facilities on the field will be supplemented to meet the requirements for an A1A rating from the Department of Commerce.

AIR TRANSPORT TRAVEL SETS SAFETY RECORD

AIR PASSENGER lines in the United States had two passenger and four pilot fatalities in the first half of 1933. The lines flew 76,642,393 passenger miles. This record of the first six months means that a passenger would fly, on the law of averages, 38,321,196 miles before a fatal mishap would occur.

Ozark Airways Plans Line

A NEW airline, running between Birmingham and Kansas City by way of Springfield and Memphis, will, according to present plans, be inaugurated early this year by Ozark Airways, Inc., owners of the operating lease on the municipal airport at Springfield, Ill. According to George M. Prescott, president, the plan has been under consideration for more than a year while officers have been studying the route and gathering data on it, making plans with Chambers of Commerce of various cities, business men along the line and officials of other airline companies.

The plan calls for four high-speed planes and a schedule of five and a half hours between the two cities. The route will cross a number of airline routes, but will not be in direct competition with any. Several new emergency landing fields, installation of radio and arrangements for passenger offices in Memphis and Birmingham are details still being worked upon.

Ozark Airways operated a line from Kansas City to Springfield for four months to test out public support and reported business which makes the extension proposed fully justified.

W.A.E. Mail Poundage Increases

AN ENCOURAGING report concerning air mail activities is evidenced in the Western Air Express statement for the first nine months of 1933 which shows 80,709 more pounds carried than during the similar period last year. The total poundage was 223,832, compared with 143,123 pounds last year. September poundage was up 11,721 over the same month in 1932.

Air express showed the healthiest gain, 191 per cent, represented in 35,099 pounds. The September poundage was 6,001 as against 1,996 a year ago. Air passengers this year also increased, with 7,471 for the first nine months, compared to 5,406 at the same time last year.

High-Speed Transportation

FAVORING WINDS helped establish a number of point-to-point speed records over United Air Lines' routes, no less than five new marks being hung up by its pilots in the new Boeing 247's.

The 418-mile stretch between New York and Cleveland was flown in 1 hour 55 minutes by Pilot John Wolf, four minutes under the previous mark and at an average of 218 miles an hour. With Pilot Richard Petty at the controls of a Boeing 247, the Omaha-Chicago section was flown at better than 200 miles an hour, the entire 433-mile trip taking 129 minutes.

Other marks were set by Pilot Tom Park between Ponca City and Wichita, a 69-mile stretch flown in 22 minutes, and by Pilot George Boyd, who, with the fastest average of all, flew the Salt Lake City-Rock Springs division in 38 minutes, averaging about 250 miles an hour.

Pilot Harry Bitterman flew between Chicago and Toledo, 218 miles, at speeds which at times exceeded four miles a minute, coming into his station in one hour flat to equal the record for that division.

Build Intermediate Field

AN APPROPRIATION of $6,700 has been given to the Aeronautics Branch of the Department of Commerce for the construction of a new landing field on the Cleveland-Albany airway to replace one which has been rendered inadequate by recent developments.

The new field will be located at Fort Plain, N. Y., instead of at Fonda, N. Y., the field change becoming necessary since the construction of oil derricks. The new field, on American Airways' route, will be larger and provide greater facilities for larger aircraft.

Express Business Advances

TWENTY-TWO HOUR air express service from New York to Chicago and imposing increases in express traffic were announced by officials of General Air Express and the Railway Express Agency Air Express System, respectively.

Under the new General Air Express schedules, express for Los Angeles and other southern California points are routed from New York to Columbus, on TWA where direct connections are made with American Airways new Lockheeds for a fast flight to the coast via Dallas, Texas. Packages leaving New York at 8.10 p.m. daily arrive at Los Angeles at 3.14 p.m. the following day.

The Railway Express Air System reported for the nine months ended September 30, an increase of 195 per cent in air express traffic carried over its routes, as compared with the same period in 1932.

AT THE AIRPORTS

Little Rock Plans Improvements

PENDING FINAL approval of a loan of $69,000 requested from the Public Works Administration, plans of Little Rock, Ark., city officials for the construction of a new administration building and hangar at the municipal airport are advancing rapidly. Architects' drawings have been completed and it is estimated work on the structure will be completed 90 days after funds are available.

The building will be a two-story structure and will house all airport offices, including those of American Airways, in addition to providing space for a large restaurant. The hangar will be 100 feet square and will be capable of housing 25 planes.

Meanwhile, officials are progressing on a plan for removing a road which crosses the airport near the south end, cutting off a 55-acre tract. The new road will wind around the airport if present plans materialize. At present, the field comprises 265 acres and since the 55 acres in question have been cleared, a field 312 acres in size with a 4,400-foot N-S runway will be immediately available when the road is removed.

Two Waco Dealers Appointed

HOWARD AILOR, president of Waco Sales of New York, Inc., Roosevelt Field, New York, has appointed two dealers to represent the Waco aircraft line. They are Richard W. Seabury of Boonton, N. J., and Newark Air Service, Newark Airport, N. J.

Seabury has already taken delivery of a cabin Waco and a Waco F-2, both Continental powered, while the Newark agency has disposed of one of the cabin jobs.

A Palm Beach, Fla., branch will be opened, and in addition to its sales activities, Waco Sales plans a flying school and a Palm Beach-Miami service.

Install Plug Testing System

AERONAUTICAL RADIO Company, operating from Roosevelt Field, N. Y., has completed the installation of a system for testing spark plugs consisting of a 2,000-pound compressed air tank which gives a constant supply of air at 300 pounds pressure.

This new high pressure test, offered without charge, enables owners to determine future performances and to detect and replace defective spark plugs when they cease to fire at low pressures.

Ohio Acts on Airport Program

A CONCENTRATED effort to improve landing fields and airports throughout the state of Ohio, through the federal works program to absorb unemployed labor, is being made by Capt. Fred L. Smith, State Director of Aeronautics. Work already has been started at Akron, Fremont and Athens. Eleven other projects, including St. Clairsville, Lima, Toledo, East Liverpool, Chesapeake, Chillicothe, Portsmouth, Springfield, Euclid, Alliance and Youngstown are pending. At Chillicothe, Capt. Smith is endeavoring to get the Federal Government to set aside part of a vast tract of land it owns for landing purposes.

HENDERSONS DIRECT RACES AT SHUSHAN

WITH THE formal opening of Shushan Airport, New Orleans, La., set for February 9-13, inclusive, Clifford and Philip Henderson have been retained to manage the Pan-American Air Races which will be held at the same time to celebrate the completion of the field. The races, being developed as a major aviation classic, have been scheduled to coincide with the Mardi Gras season in New Orleans. Headquarters of the Hendersons are at the Roosevelt Hotel in New Orleans.

Maryland Cities to Seek Aid

TAKING ADVANTAGE of the opportunity offered by the Department of Commerce in providing funds for the construction and improvement of landing fields, two Maryland cities, Hagerstown and Williamsport, are both planning to ask Federal aid along these lines.

Hagerstown, one of the largest cities in the state outside of Baltimore, is located in the western section of Maryland and only recently purchased its airport from private interests. City officials, however, believe the purchase of 26 additional acres will bring the field up to government regulations.

Williamsport is located on the eastern shore of the state and occupies a strategic position as an airport for that section.

Stinson Agency Awarded

COMMERCIAL AIRCRAFT Company has been given the Oregon agency for the complete line of Stinson aircraft, according to William H. Turner, president of the new organization. In addition to its sales activities, the company will conduct a flying school and an aerial service at Swan Island.

Install More Lights at Madison

THE COMMON Council of the city of Madison, Wisconsin, has appropriated $1,700 for the installation of additional lights and boundary markers at Royal Airport in that city. Work on the installation is now well under way.

Airport Subsidiary Formed

NORTHWEST PHILADELPHIA Airport, Inc., was recently formed as a subsidiary of F. & S. Aircraft Corporation to take over the operation of Rising Sun Airport. Coincident with the organization of the company, the name of the airport was changed to Northeast Philadelphia Airport.

Several improvements were made at the field, including the construction of a building housing a workshop and flight office; the installation of a lighting system in the hangar, a public address system and additional facilities for student instruction and storing and servicing of aircraft.

The president of the new subsidiary, also president of the parent company, is Joseph A. Simcock.

Control Traffic Flow at Newark

A PRECISION method of aerial traffic control, regarded as the most advanced and efficient ever devised has been placed in operation at Newark Airport, Newark, N. J.

The system comprises a communication network employing telephones, loud speakers and radio to give ground personnel and all outgoing and incoming pilots exact information on the position, course and altitude of all planes within a five-mile radius of the airport when visibility is good, and as far away as ten miles or more under adverse weather conditions. Every incoming airline pilot reports his position, course and altitude by radio when he is from five to ten miles from the field, depending on the visibility. This report, received by the company employing the pilot, is transmitted at once by interconnecting telephone and loud speaker to the operations departments of the other lines, which immediately flash it by radio to their own pilots. Take-offs also are reported by the same means to all arriving pilots, so that every pilot within the airport area is given absolutely accurate, up-to-the-minute reports of the movements of all other aircraft in the same area.

New Operators at Love Field

RECONDITIONING AND rebuilding of aircraft and aircraft engines is now being carried on in Hangar No. 2, Love Field, Dallas, Tex., by Lou Foote-Van Cleave Aircraft Co., in conjunction with the Lou Foote Flying Service which is maintained for charter and cross-country flights in a Wright-powered Travel Air.

Foote was formerly pilot and airway engineer for American Airways while William F. Van Cleave is a designer, engineer, builder and inventor.

Finds Foreign Field Lucrative

E. L. ERICKSON, president of Aero Brokerage Service Company, Los Angeles Municipal Airport, reports he is profitably tapping the foreign and overseas market for used planes and equipment. For several years Erickson has kept his contacts constantly alive with Latin American, Alaskan, Hawaiian and Far Eastern prospects and finds that these buyers come directly to him with their wants.

Only recently, within a period of two weeks, Erickson delivered an International J-5 and a Stearman J-5 to George Law of Chihuahua, Mexico; a Stinson J-5 to General Amundo Sanchez Cano of the same country and a Fairchild 22 to Hajime Onishi of Japan, a prominent member of the Japanese Aeronautical Society, who at the same time purchased a spare motor, extra propeller and other equipment. Another sale to a foreign purchaser was a Ryan Brougham to E. W. Kingsley of Honduras. Meanwhile, Erickson is negotiating with prospects in Honolulu and Adelaide, Australia, to whom he expects to make substantial sales in the near future.

Rebuild Airport with Loan

GOVERNMENT FINANCIAL aid and appropriations for the city of Brownsville, Tex., the center of a disastrous hurricane and flood last year, include the sum of $45,000 for the reconstruction and improvement of the local Pan American Airport, which was flooded, had its hangars damaged and suffered other losses during the storms.

Weather Bureau in New Quarters

THE CITY Council of Dallas, Tex., has made an appropriation for the rental of space for the quarters of the United States Weather Bureau of the Department of Commerce in the Airport Utilities Company building at Love Field formerly occupied by American Airways.

Personnel and equipment of the airline company have been moved to a new building at Meacham Field.

Manila Gets Land for Field

MORE THAN 3,100 square feet of land, now under water, adjoining the south breakwater of Manila, P. I., have been acquired, through proclamation, by the Governor General of the island, for the development of a city airport. The action was taken as part of the port development plan to fill in the land with dredgings from the harbor.

Plan $20,000 Airport

A NEW airport, to cost $20,000, is being planned in Provo, fourth largest city in Utah, according to Mayor Jesse N. Ellertson, who has pending an application to secure money from the Government. It is understood the city has the cooperation of the Department of Commerce in its endeavors.

Mayor Ellertson said the city is planning to build one of the most modern airports in the West, to bring to a successful conclusion years of effort by the Chamber of Commerce and city officials for the construction of a suitable landing area.

$65,000 ALLOTTED FOR NEW ENGLAND AIRWAY

THE STATE of Maine has received an allottment of $65,000 from the Government for the construction of auxiliary airports along an airway from Kittery to Caribou by way of Portland, Brunswick, Augusta, Waterville and Bangor. Work will be done on state or municipally owned sites between key airports along the route. Other projects in the state are under consideration at Auburn and at Bangor.

Offers Electric Generators

A COMPLETE line of electric generators for aircraft, available in six- and twelve-volt capacities, is offered by Air Transport Equipment, Inc., Roosevelt Field, New York, in addition to a kit of special tools and parts for the reinforcement of Kinner K-5 cylinder heads. The kit consists of all the necessary tools and sufficient material to complete 20 cylinder heads.

Tyler Celebrates Anniversary

THE FOURTH annual anniversary celebration of the Tyler, Tex., municipal airport was staged recently and, despite inclement weather, the largest crowd ever to assemble at such an occasion was present. Among the fliers at the field for the events were Reg Robbins, Ross Illif, O. C. Palmer, airport manager, and Carl Everett. Several oil companies sent their ships to the field to attend.

Plan Hagerstown Improvements

HAGERSTOWN, MD., is about to have a larger and better airport as a result of a definite decision arrived at by city officials and others interested in pushing aviation in the town. At a conference it was decided to enlarge and improve the site and plans are now being worked out and steps taken towards elaborating the airport.

New Operator at Seattle

SEATTLE FLYING Service, Inc., has been organized to provide Seattle, Wash., pilots and students with modern equipment for use at Boeing Field, the company's headquarters. Its officers are Norman F. Storm, president; Allen Brown, vice-president and Grant Calhoun, secretary. Rodney McArdle is treasurer of the organization.

Tacoma Seeks ATA Rating

PROVIDED WITH financial aid through the civil works program, J. D. Crichton, airport manager and County Commissioner R. Lester Kelly, launched a number of improvement projects at the Tacoma, Wash., airport hoping to attain an ATA rating from the Department of Commerce. The field already has an A1A rating.

A force of 119 men is at work widening the runways, relocating the lighting system for better illumination and moving the boundary lights so that all details toward the highest airport rating obtainable will be met before Spring.

Coffeyville Airport Dedicated

THE NEW 172-acre municipal airport at Coffeyville, Kan., was formally opened with appropriate ceremonies, which city and state officials and a crowd estimated at 3,500 attended.

The field is situated two and a half miles from the city; it provides two runways, one 120 by 2,800 feet; a combination hangar-administration building and gas, water and electric facilities. Lighting equipment at present consists of two floodlights, a ceiling projector and a lighted wind-sock, but it is planned to make a complete lighting installation in the near future.

Work has started on five tennis courts on the field, and upon their completion it is expected to construct an airport swimming pool. Landscaping and other improvements will be undertaken when weather conditions permit.

R. F. C. Aid for Texas Port

MORE RUNWAYS will be constructed at Meacham Field, Fort Worth, Tex., municipal airport with the $75,000 awarded the city by the Reconstruction Finance Corporation and, if additional finances being sought in Washington, D. C., are obtained, work will be started on a passenger-terminal building.

Autogiro Company at Richmond

HANGARS AND other buildings on old Charles Flying Field, Richmond, Va., have been purchased and the field leased by the newly organized Autogiro Sales and Industrial Service, Inc. Improvements will be made on the hangars and field in the very near future.

Officers are Frank Williams, president; James Birnie, Jr., secretary, and Patrick A. Gibson and T. J. Keane, vice-presidents.

New Love Field Manager Appointed

SCORING THE highest grades in civil service examinations for the post, W. L. Williams was appointed supervisor of Love Field, Dallas, to succeed Preston Sneed. David Robinson, Jr., assistant city manager and airport director, made the appointment.

THE INDUSTRY IN GENERAL

New Planes and Engines Approved

APPROVED TYPE certificates have been issued by the Aeronautics Branch of the Department of Commerce for five aircraft and three engine models as follows:

Lockheed Aircraft Corp., Burbank, Calif., model Orion 9D, one to five-place closed, land, monoplane powered by P. & W. Wasp S1D1, 550 h.p. Weights (lbs.): empty, 3713; useful load, 1687; gross, 5400. As mail plane, weights (lbs.): empty, 3676; useful load, 1924; gross, 5600. A.T.C. No. 514.

Kinner Airplane & Motor Corp., Ltd., Glendale, Calif., model Sportster B, two-place, open, land monoplane powered by Kinner B5, 215 h.p. Weights (lbs.): empty, 1209; useful load, 616; gross, 1825. A.T.C. No. 516.

Kreider-Reisner Aircraft Co., Inc., Hagerstown, Md., model Fairchild 22 C7F, two-place, open, land, monoplane powered by Warner Super Scarab, 145 h.p. Weights (lbs.): empty, 1133; useful load, 617; gross, 1750. A.T.C. No. 517

Stinson Aircraft Corp., Wayne, Mich., model Junior SR4, four-place, closed, land, monoplane powered by Wright R760, 250 h.p. Weights (lbs.): empty, 2237; useful load, 1088; gross, 3325. A.T.C. No. 519.

Stinson model O, two-place, open, land, monoplane powered by Lycoming R680-4, 220 h.p. Weights (lbs.): empty, 1907, useful load, 710; gross, 2617. A.T.C. No. 520.

Pratt & Whitney Aircraft Corp., E. Hartford, Conn., model Hornet SD, nine-cylinder, radial, air-cooled engine rated 675 h.p. at 2050 r.p.m. at 6000 feet. Octane 87. A.T.C. No. 106.

Pratt & Whitney model Hornet T1D1G, nine-cylinder, radial, air-cooled engine rated 700 h.p. at 2150 r.p.m. Geared 3:2. Octane 87. A.T.C. No. 109.

Lycoming Manufacturing Co., Williamsport, Pa., model R680-4, nine-cylinder, radial, air-cooled engine rated 220 h.p. at 2050 r.p.m. Octane 58. A.T.C. No. 108.

October Exports Total $678,727

BRAZIL SPENT $168,413 for American aeronautical equipment, more than any other country, according to preliminary statistics for October, 1933, issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce.

Germany was the next largest spender, buying engines worth $63,500 and equipment worth $31,154, while Panama spent $45,000 for aircraft, $10,000 for engines and $1,772 for parts and accessories.

China, which was the largest purchaser the preceding month, spent $87,894 in October. Russia bought $17,475 worth of equipment during the same period.

The total value of all exports of aeronautical equipment for the month was $678,727.

GRIFFIN AND DYCER IN INSPECTOR POSTS

NEW AERONAUTICAL inspectors in the field service of the Aeronautics Branch of the Department of Commerce were recently appointed. They are Bennett Griffin, of Oklahoma, who goes to the Dallas area and Charles F. Dycer, of California, who will go to the Chicago district. Griffin is remembered for his attempted flight around the world with James Mattern while Dycer was connected with Dycer Airport and Dycer Flying Service in addition to various organizations in California.

Ex-Cell-O Shipments Increase

SHAREHOLDERS AT a special meeting of the Ex-Cell-O Aircraft & Tool Corp. were told by N. A. Woodworth, president, that shipments for December 1933, were approximately double those of December 1932 and November shipments were more than double those of a year previous.

The statement for the first nine months of 1933, however, showed a loss slightly in excess of depreciation, but Woodworth said this included considerable sums spent in developments of new products which already have given the company greater diversification and placed it in an advantageous position.

The 1934 Davis D1-W high-wing monoplane with Warner Scarab engine

15,183 Answer Questionnaire

DURING THE first two weeks following the mailing of a memorandum to licensed pilots, mechanics and students by the Aeronautics Branch requesting that they signify whether or not they would be interested in purchasing airplanes if production could be undertaken on a volume basis to permit a $700 selling price, 15,193 replies were received by the Department, 55 per cent, representing 8,280 persons, saying that they would purchase such a craft.

A survey of replies shows that 18 per cent said they would buy under certain conditions and 27 per cent said they could not or would not buy. Those answering affirmatively, but qualifying this answer by saying that they would want to see the airplanes, that they were not certain their financial condition would justify purchasing aircraft a few months hence or making some other provisional reply, totaled 2,676. Negative responses came from 4,227.

In answer to the question as to how many friends or acquaintances would be probable purchasers of such a craft, 49,391 such persons were listed, but this figure includes duplication since several different pilots might have mentioned the same person when answering.

Pitcairn Suspends Activities

WITH THE Autogiro Company of America entering upon an intensive development program and because of present conditions, Pitcairn Autogiro Company is suspending manufacturing until further notice, but according to Harold F. Pitcairn, president, it will maintain adequate facilities for servicing the autogiros now in use.

Fairchild Appoints Dealer

INTER-CITY Airlines, Inc., located at the Boston Municipal Airport, East Boston, Mass., has been appointed dealer for Fairchild aircraft.

A new Warner-powered Fairchild 22 has been delivered to the company.

Three Get Government Posts

AMONG THE recent appointees to Government positions pertaining to aviation are Phoebe Omlie, Lloyd Juelson and Joseph Shumate.

Juelson has been added to the Aeronautic Branch staff as an aeronautics development expert, while Shumate has taken the place of G. E. Gardner, who resigned as chief of the General Inspection Service. Miss Omlie was appointed a member of the National Advisory Board on Aviation and is the first woman ever named to a Government post in aviation.

(*Continued from preceding page*)

Navy Spends Millions With Industry

SIX PROJECTS will each receive a slice of the $7,500,000 allotted under the National Industrial Recovery Act to the Bureau of Aeronautics, Navy Department.

The greatest portion of the money, $6,114,391, will be used to procure 130 new aircraft, including radio and other instruments. The purchase of additional instruments will cost $213,250; radio equipment, $457,759; improvement of power plants, $489,600; structural alterations in aircraft, $50,000, and manufacture of new airplane handling devices, $175,000.

Davis D1-W Makes Debut

DAVIS AIRCRAFT Corp., Richmond, Ind., has just introduced its new D1-W powered with the Warner Scarab 125-horsepower engine.

Both front and rear cockpits are enclosed, with the enclosure opening from the center outward.

Standard equipment includes the bulge type NACA cowling, wheel pants, Hamilton Standard steel propeller and 6.50 x 10 wheels and brakes. According to Walter C. Davis, president, performance has been materially improved by streamlining all exposed fittings which, together with the cowling and wheel pants, enables the plane to cruise well over 120 miles an hour.

Careful attention to the baffling of the cylinders has produced, he said, exceedingly satisfactory cylinder head temperature.

Vidal Appointed to N.A.C.A.

PRESIDENT ROOSEVELT has appointed Eugene L. Vidal, Director of Aeronautics, as a member of the National Advisory Committee for Aeronautics to succeed Dr. William F. Durand, resigned.

Crawford Heads Thompson Products

FREDERICK C. CRAWFORD, who since 1929 has been first vice-president and general manager of Thompson Products, Inc., of Cleveland, has been elected to the presidency, succeeding Charles E. Thompson, founder of the company, who died October 4.

New Association Formed

NATIONAL AIRPORTS Operators Association was formed and at a recent meeting of members at the Rhode Island State Airport, Ben B. Follett, Jr., was elected president for a term of years to be decided by a Board of Directors. The organization has for its aims a number of purposes for the advancement of the industry and tentatively has decided upon a program of achievement.

Members plan to foster the establishment of suitably marked auxiliary landing fields throughout New England and eventually throughout the country; compile and issue a sales bulletin and strive to achieve the purchase of supplies and equipment on a group plan.

At the initial meeting were representatives of E. W. Wiggins Airways, Ames Skyways, Falmouth Airport, United Airports of Connecticut, Eastern Aeronautical Corp., What Cheer Airport, Providence Airport, Bowles-Agawam Airport, Wellesley-Natick Airport Corp., Riverhead Airport and Viking Flying Boat Corp.

(*Continued on following page*)

• Digest of Recent Events •

Ask $79,000,000 To Build War Planes

PRESIDENT ROOSEVELT was in receipt of a resolution passed by the Aeronautical Chamber of Commerce requesting that $79,000,000 of public works funds be set aside immediately for the aircraft construction programs of the army and navy to provide absolutely essential equipment for these services for any national emergency. The funds requested make up the $39,000,000 and $40,000,000 sought by the War Department and the Bureau of Aeronautics, respectively. NOV. 26.

Air Experts Get CWA Positions

APPROXIMATELY 250 aviation technicians will be given CWA employment as advisors in selection and development of airport sites under the new Civil Works Administration's program for the establishment of a nation wide network of landing fields, according to Harry L. Hopkins. DEC. 5.

Let Contract for Large Mapping Project

SECRETARY OF the Interior Ickes awarded the Fairchild Aerial Surveys, Inc., a contract for making the largest single aerial photographic map ever undertaken. It will depict 24,500 square miles of the Navajo and Zuni Indian reservations in the Southwest and will be used by the Soil Erosion Service for erosion control. The map will be a mosaic assembled from more than 4,500 individual photographs, the pictures to be used in the Stereoplanigraph to produce actual contour maps. DEC. 7.

Ellsworth Off To Antarctic

THE WYATT EARP, bearing the members of the Ellsworth transantarctic flight expedition on their polar adventure, sailed from Dunedin, New Zealand, their last port of call. Six days later, it was reported that the ship was battling teriffic winds and lumpy seas, but that more than 1,000 miles had been covered since the ship sailed. DEC. 11.

Homologate Settle Balloon Record

THE ALTITUDE of 18,665 meters (62,237 feet) attained by Lieut. Comdr. T. W. G. Settle and Major Chester Fordney in their balloon flight from Akron, Ohio, was formally recognized with brief ceremonies as a world's record by the Federation Aeronautique Internationale. DEC. 13.

First Hero Medal Awarded to Pilot

THE AIR Mail Fliers' Medal of Honor was presented to Pilot Mal B. Freeburg of Northwest Airways, Inc., by President Roosevelt for his act of maneuvering his plane to safety after one of his engines had torn loose from its fastenings. The engine was shaken loose by the pilot over the Mississippi River, after which the damaged plane was landed safely. Freeburg is the first pilot to receive the medal, presented under authority of Congress. DEC. 15.

Lindberghs Complete 30,000-Mile Air Trip

FIVE MONTHS after they left New York, Col. and Mrs. Lindbergh returned in the Wright-powered Lockheed with a log-book which recorded more than 30,000 miles of flying, practically all but 3,000 miles of which was exploratory work in the interests of securing important technical data relative to the study of feasible commercial routes across the Atlantic. On the survey, the Lindberghs touched four continents, visited 21 countries and colonies and flew across the North and South Atlantic oceans. DEC. 19.

Anniversary of Flight Remembered

THE THIRTIETH anniversary of heavier-than-air flight was remembered throughout the nation when various races, events and meetings were held to commemorate the Wrights' first flight at Kitty Hawk, December 17, 1903. At Washington, D. C., 104 Army, Navy and Marine planes staged a giant aerial circus while at Philadelphia, Pa., Wilbur Wright was honored at the opening of the new Franklin Institute. Inclement weather, however, curtailed to a very large extent the aerial demonstrations planned for the day which was set aside as National Aviation Day in the country. DEC. 17

• Coming Events •

Competition for design of dirigible airshed ends. Institute for Scientific Research of Experimental Airship Construction and Operation. Dirigeablestroy, Moscow, Russia. JAN. 1, 1934.

Annual Dinner, Society of Automotive Engineers, New York, N. Y. JAN. 8.

Sixth Annual Miami All-American Air Races at Miami, Florida. JAN. 11-13.

Annual Meeting, Society of Automotive Engineers, Detroit. Mich. JAN. 22-25.

Dedication and opening, Shushan Airport, New Orleans, La. Air races and events. FEB. 9-13.

Second Annual Tucson Air Show, Tucson, Ariz., chapter National Aeronautic Association. Allen L. Stephens, president. FEB. 17-18.

Entries for Wm. E. Boeing Scholarships close. Boeing School of Aeronautics, Oakland, Calif. APRIL 1.

International Show of Sport and Touring Aviation under auspices of Aero Club of Switzerland. Palais des Expositions, Geneva. APRIL 27-MAY 6.

Grand Prix of the Aero Club of France. Speed races between Deauville and Cannes and return for cash prizes and Armand Esders Trophy Cup. JULY 21-22.

Fly South on EDO Floats

Fly South this year in your favorite ship—on Edo Floats. Explore the palmetto fringed bayous of Louisiana and Florida. If you're after business, reach the crowds at the waterfronts. At will, you can switch back and forth from wheels to Edo Floats, owning "both planes" for the cost of one. For information of Edo Standard Float installations for 50 popular types of land planes, address Edo Aircraft Corp., 610 Second St., College Point, L. I., N. Y.

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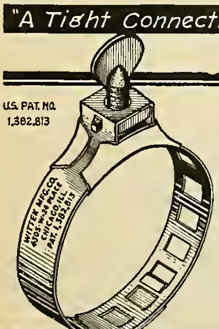
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2—The research and construction methods developed by the Boeing, Chance Vought, Sikorsky and Stearman airplane factories, and by Hamilton Standard Propeller and Pratt & Whitney ("Wasp" and "Hornet" engines.)

Boeing School of Aeronautics is an affiliate of the companies of United Aircraft and Transport Corporation. The standards that brought them to world leadership are the standards maintained in its instruction. Department of Commerce requirements are *exceeded* here—Boeing students are already seasoned when they graduate; they have accomplished more than just "learning to fly".

Any airmail pilot or Boeing graduate will be glad to tell you more. Meantime, send for an illustrated School Bulletin describing courses and enrollment requirements and picturing the Airport. The coupon below is for your convenience.

Next regular enrollment, April 3

BOEING SCHOOL OF AERONAUTICS

Division of UNITED AIRCRAFT AND TRANSPORT CORP.

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(*Open to holders of Transport Licenses*)

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Years in High School________________ Years in College______

Address________________

City________________ State______

(Continued from preceding page)

Transport to Test Blind Landings

A NEW series of blind landing tests will be conducted at Newark, N. J., airport in a tri-motored transport plane, following successful experiments of the radio system in light training planes and six-passenger cabin monoplanes. The Department of Commerce has installed the blind landing system for practical service trials and James L. Kinney, airline inspector and test pilot, will fly the tri-motored ship.

The tri-motor is being equipped with a small receiving set for the landing beam, an instrument for registering signals of the runway localizing beacon and the landing beam, and an approximate distance indicator which gives information as to the number of miles the blind landing plane is away from the transmitter.

A second blind landing system similar to the one at Newark is being installed at Oakland, Calif., municipal airport by the Department with the cooperation of the Port of Oakland.

New Beechcraft Almost Ready

A NEW 225-horsepower ship, built along similar lines to the high-speed 420-horsepowered Beechcraft, will be announced shortly by Beech Aircraft Co., Wichita, Kans.

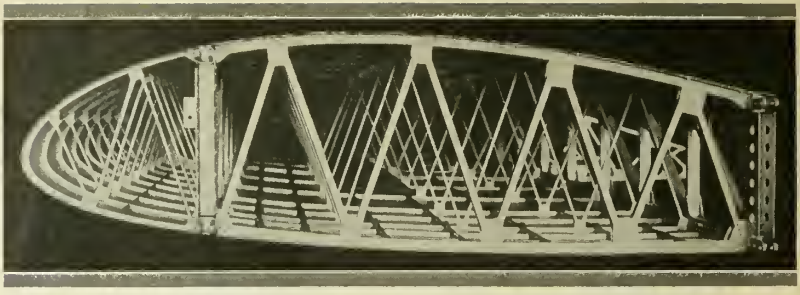
The new ship will offer many of the characteristics of the larger ship. It cruises between 145 and 155 miles an hour and provides accommodations for four passengers.

Among construction features promised are sound-proofing of the cabin, ample visibility through the use of a reverse wing stagger and a retractable landing gear.

Walter Beech, president of the company, reports that the plane will have a top speed of 170 or more miles an hour, but through the use of flaps and the drag produced when the landing gear is released, its landing speed will be about 45 miles an hour.

Sperry Moves Offices

EXECUTIVE SPACE has been leased on the 32nd floor of the new RCA Building in New York City by the Sperry Corporation and its wholly owned subsidiaries, the Sperry Gyroscope Company, Inc., the Ford Instrument Company, Inc., and the Intercontinent Aviation, Inc., which is engaged in foreign aeronautical activities.



A cross-section of the wing structure for the Boeing 247 airliner

Simultaneously, it was announced that the Sperry Gyroscope company had received an order from the United States Navy for Gyro-Compasses which will be installed on the cruisers, aircraft carriers, gun boats, destroyers and submarines now under construction. The contract amounts to $452,000.

INDUSTRY FIRST TO REACH RELIEF QUOTA

THE AVIATION industry whose committee, under the chairmanship of J. T. Trippe reached and exceeded its Relief Fund quota in 1932 in record time, is again, under the chairmanship of Mr. Trippe, at the head of the list of 87 industries enlisted in the Citizen Family Welfare Committee Drive for Unemployment Relief Funds, by being the first to fulfill its quota in 1933.

With Mr. Trippe on the committee were E. R. Breech, P. G. Johnson and Thomas Morgan.

Spray Device Makers Name Agent

HOMESTEAD Valve Manufacturing Co. of Coraopolis, Pa., announced recently that they had appointed Reeves-McCormick, Inc., of Philadelphia, Pa., as exclusive representative covering the Philadelphia district for the sale of Hypressure Jenny, their vapor spray machine used for aeronautical cleaning.

Form Picture Transport Company

AS A direct outgrowth of frequent calls for airplanes to transport important news picture from Miami to the north, particularly New York, three of Miami's oldest pilots have consolidated their services and formed the News-Photo Dispatch Company. These men, Karl E. Voelter, Robert Moore and W . H. Grevemeyer, were individually engaged by various picture agencies for some years and by the combination believe their service will be enhanced.

Moore will be in charge of seaplanes, having made numerous crossings of the Gulf Stream. He is also an experienced aerial cameraman and has a complete aerial photographic equipment.

The company now has five planes, including two seaplanes, and it is reported new and faster equipment will be secured shortly. Operating bases will be maintained at three points in Miami.

Allegheny Alloys in Wire Products

ARRANGEMENTS have been concluded whereby the American Chain Co. and associate companies will take over the drawing, fabrication and sale of Allegheny metal and other Allegheny alloys in round, flat and shaped wire forms. This wire is to be marketed under the name of Page-Allegheny Alloys, and will be sold by the Page Steel and Wire Co. of Monessen, Pa. In the plant of the Hazard Wire Rope Co., Wilkes-Barre, Pa., various forms of wire rope will be made from these alloys, and at the York, Pa., plant of the American Chain Co., chains and chain attachments are to be produced.

(Continued on following page)

AT *the* AIRPORT *or* IN *Your* HOME

Westport Airport Radio, $39.50

You can pick up "the weather" or your favorite entertainment broadcast at will. A fitting companion to the famous WESTPORT AIRCRAFT RADIO, the new WESTPORT AIRPORT RADIO works directly from a light socket. Distributed in the West by

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This school is operated by nationally-known men:

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IS NOW operating the Curtiss-Wright School of Aeronautics at Curtiss-Wright Airport, Valley Stream, L. I., N. Y., and offers the most complete

PRACTICAL AERONAUTICAL ENGINEERING COURSE

in the EAST. More than 2,000 hours of Practical Training on licensed airplanes, engines, propellers, welding and instruments.

The school is now in its fourth successful year of operation.

SPECIAL OFFER
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on your Practical Aeronautical Engineering Course.
Be sure to give your full name, address and age.

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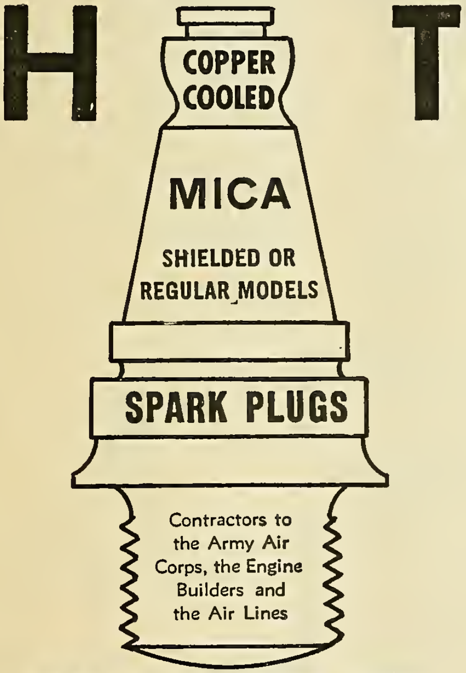
UNITED STATES GOVERNMENT APPROVED REPAIR STATION NO. 132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COPPER COOLED
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SHIELDED OR REGULAR MODELS
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Contractors to the Army Air Corps, the Engine Builders and the Air Lines

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305 EAST 45th ST., N. Y. C.

A Heater.... for Your Aeronca

THE new Aeronca heater gives you summer comfort during winter flying. It is easy to install; will keep any cabin Aeronca snug and comfortable in spite of frigid weather. Operates from the exhaust system; nothing to get out of order.

Removable for summer season.

FLYING SCHOOL OPERATORS—Install the new Aeronca Heater, and facilitate year 'round operations.

Details and price sent promptly on request

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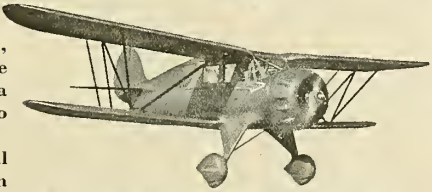
A new thrill for Sophisticated Flyers

● If you're an old-timer at flying, the sleek, streamlined fuselage of the WACO Model C will give you a thrill you probably never expected to have again.

If you're new at the game, you'll get a certain solid satisfaction from the beautiful way this ship handles in the air and its ability to get in and out of tight places.

Here, for quick reading, are some of the "high spots." Luxurious, form-fitting seats. Better vision from both front and rear windows. Controlled interior ventilation. A cruising speed of 125 miles an hour, with 145 an hour top speed if you want it.

See this wonder ship the first chance you get. Or write for facts and figures. They will be sent free and postage paid without the slightest obligation on your part.



WACO AIRCRAFT CO., TROY, OHIO, U. S. A.
WACO AIRPLANES
"Ask any pilot"

WACO LEADS IN AIRCRAFT REGISTRATIONS

(*Continued from preceding page*)

Offer Consulting Service

A CONSULTING engineering service company has been formed under the name of Granville, Miller & DeLackner with offices at 101 Park Avenue, New York, N. Y., for the purpose of offering a complete aeronautical and automotive engineering service ranging from inception to operation and for the investigation of new ideas, research, wind-tunnel work, design and stress-analysis.

Actual construction work will be undertaken at the Granville factory.

The group has had an usually broad experience which covers the original design, building and operation of some 30 ships, many of which under the trade name GEE BEE have become world-known because of their performances.

New Amphibion Introduced

A NEW CABIN amphibion, designed and built by Grover Loening, has been successfully test flown following its completion at the Grover Loening Aircraft factory, Roosevelt Field, New York. The ship is a direct development of the old Loening Commuter biplane type and is expected to be about 30 miles an hour faster, with the same landing speed.

The plane attracted interest because of its monoplane design, its streamlined hull and split trailing edge wing flaps. Another feature is found in the new type ailerons which are characterized by a very short span and long depth moving through differential angles much higher than heretofore used. Equipment includes a controllable pitch propeller and special hydraulic wheel brakes.

Bertrandias Goes to Far East

MAJOR V. E. BERTRANDIAS has relinquished his duties as sales manager of General Aviation Manufacturing Corp., Baltimore, Md., to represent that company and B/J Aircraft Corp. in the Far East and the Curtiss-Wright Export Corp. in Japan.

When Major Bertrandias sailed for Yokohama, a General Aviation GA-43 all-metal, 10-passenger, low-wing transport, recently sold to Mitsui & Company for use in airline work, was in the cargo.

Charles Froesch, General Aviation's Service Manager, will handle all commercial sales matters for the firm.

Radio Report Broadcast Changes

SEQUENCE and wording have been changed in weather report broadcasts by radiophone over the Department of Commerce radio communication stations. This sequence is now followed: Announcement of station identification, time, detailed weather report (once only), station identification.

Lindberghs Give Plane to Museum

THE PLANE and all the equipment used by Colonel and Mrs. Lindbergh on their 30,000-mile survey flight, in which they spanned both the North and South Atlantic and visited 21 countries, has been presented to the American Museum of Natural History.

The plane is the same ship in which the Lindberghs established a new transcontinental record in 1930 and in which they flew to the Far East the following year. It is a Lockheed Sirius, powered by a Wright Cyclone engine and equipped with Edo floats and a Hamilton Standard controllable pitch propeller.

Such equipment as the two radio sets, sextant, charts, maps, log book, an eight-foot rubber boat, parachutes, electrically heated flying clothes, landing flares and other instruments, including a Sperry horizon, will be exhibited.

Two items the Lindberghs could not give were the fuel and oil they used. It is interesting to note that the Stanavo Specification Board, Inc., had supervision of the fueling arrangements for the fliers. At practically every point of call American products awaited them. Despite the fact that the Lindberghs were away for five months and flew over four continents, they used only American oil and fuel supplies, evidence of the growth of the American aviation industry.

THERE ARE REASONS...

WHY the Casey Jones School of Aeronautics, Inc., has enjoyed a steady and unprecedented healthy growth in student enrollments.

WHY 33⅓% of the students who enrolled for the one-year Mechanics' Courses have extended to the two-year Aeronautical Engineering Courses.

THEY ARE *because* this school's efforts are concentrated on mechanical and engineering instruction exclusively; *because* every instructor is a seasoned expert in his particular profession; *because* each student is given individual attention and is made to realize that his ultimate success depends largely on his own initiative; *because* the curriculum is arranged in a practical manner to meet the requirements of the aeronautical industry; *because* equipment and facilities are adequate, up-to-date and properly maintained; *because* the school's interest in its students does not cease with graduation.—You invited to write for literature.

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THE GOVERNMENT

NEXT CLASSES IN
AERONAUTICAL
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begin January 8th
(*Enrollments will be accepted up to January 31st*)

•

DAY & NIGHT CLASSES
FOR
MECHANICS' COURSES
begin January 8th and the first Monday of each month thereafter.

• THE AIR SERVICES •

Air Services Buy Texaco

THE TEXAS Company has been awarded a contract by the United States Army covering shipments of aviation oils to various army fields over a period of 90 days. Another contract was awarded by the Navy covering motor fuel "V" for the period from November 1, 1933, to April 30, 1934.

At several points, Texaco received the awards over other competitors who did not propose to furnish gasoline strictly in accordance with motor fuel "V" specifications.

National Guard Unit Near Record

ONE OF THE best flight records in National Guard aviation was established during 1933 by the 103rd Observation Squadron, 28th Division Aviation, Pennsylvania National Guard. Members of the group logged 1,926 flying hours without a single fatality or engine failure.

Over the same period, training throughout the unit was kept well-balanced and efficiency promoted generally. Major Victor Dallin is in command of the squadron which bases at the Philadelphia Airport.

Start on Coast Guard Air Base

CONSTRUCTION OF the U. S. Coast Guard air base at Galveston, Tex., to cost about $290,000, started November 1. Between 30 and 40 men will be permanently based at the port with a monthly payroll of approximately $10,000.

Two Buildings for Wright Field

THE MATERIEL Division at Wright Field, Dayton, Ohio, will be supplied with two new buildings following allocation of funds for this purpose.

One of the new structures will be a Static Test Laboratory for the purpose of conducting static and dynamic tests; the other will be a Technical Data Building which will house the various operating units of the Technical Data Branch. These buildings will cost $107,000 and $200,000 respectively.

Drawings have been completed and architects are now working on the plans. Actual construction is expected to start within a short time.

NAVY PLANES AWAIT O. K ON OCEAN FLIGHT

MOTORS OVERHAULED and larger fuel tanks installed, six Consolidated Navy patrol planes are prepared for a 2,200-mile non-stop flight from San Francisco to Hawaii early this month if permission is obtained from Washington. These are the same planes that flew to San Diego from Norfolk, Va., by way of the Canal Zone and which set a formation flight non-stop record on the first leg of their trip. Should the flight be made it will be the first time that a mass non-stop formation flight of such a distance has been projected.

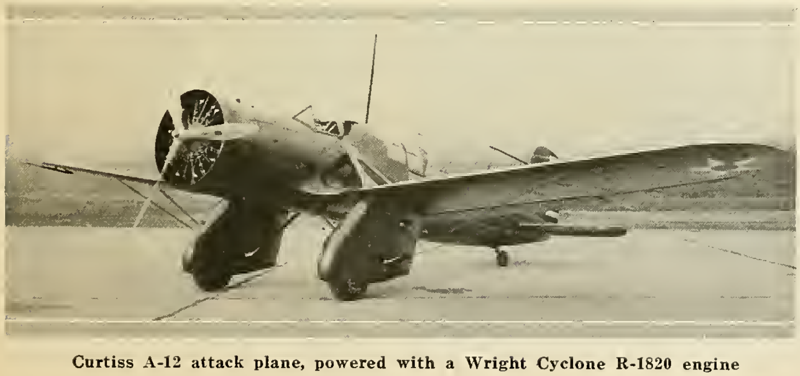
Inspect Haiti Air Arm

MAJOR ROY S. GEIGER, in charge of Marine Corps Aviation, left Quantico, Va., in a Sikorsky amphibion for Port au Prince, Haiti, where he inspected Observation Squadron 9-M.

With him was Capt. F. B. Mulcahy, Lieut. F. G. Cowie and Lieut. J. F. Plachta, all of the Marine Corps and W. S. Garland of the Aeronautics Branch of the Department of Commerce. A stop was made at Opa Locka, Fla., where the Scouting Squadron 3M-R, Marine Reserve, was also inspected.

Night Deck Landings Praised

THE SECRETARY of the Navy has sent letters of commendation to four naval aviators for their success in making the first night landings on an aircraft carrier underway in April, 1925. These landings were made under varying lighting and weather conditions.



Curtiss A-12 attack plane, powered with a Wright Cyclone R-1820 engine

Aberdeen Field to Be Improved

EXTENSION OF the air field at Aberdeen, Md., will be effected through an allotment by the Public Works Administration for extensive improvements at the Aberdeen Proving Ground.

Of the total allotted, $627,000 will be used to enlarge the field while $115,000 will be available for the construction of a hangar. The field is one of the sites where Air Corps bombing equipment for aircraft is tested.

Build Runway at Selfridge

A CONCRETE runway, 120 feet wide, and extending E-W, the full length of the line of hangars, is now under construction at Selfridge Field.

AIR—HOT AND OTHERWISE

(*Continued from page* 17)

Navy been equipped to its authorized strength, the strength which the able officers in the service estimated as the lowest possible number necessary to the peace-time needs of defense.

The slow development of private flying and the failure of Congress to appropriate sufficient funds with which to maintain the air forces at authorized strength in aircraft equipment are two of the weak spots in our industrial fabric at this time. They have placed in a very precarious position the large, splendidly equipped plants which years of investigation and study convinced Congress are necessary for national defense. It is believed that our factories could turn out about 75 new military machines during the first month after the declaration of war, as compared to 150 by Great Britain, 200 by France, 80 by Italy, and 60 by Japan and Russia individually. That is due to the fact that the other air powers for some years have been supporting their plants through Government orders, more extensively, than is the case here.

At the same time we are prepared to gear up our plants so that we can produce 1,000 planes during the seventh month after a declaration of war, a production equal only to that of either Great Britain or France for the same period. Meanwhile, we are confronted with the imminent possibility of keeping available and in condition our idle machinery, maintaining our engineering staffs and having on hand a record of the skilled labor we can depend upon if and when the Government asks us to meet this obligation in an emergency.

If the Government will release the funds for the authorized military and naval aeronautical construction we will have an air force which will rank FIRST, as it should be, instead of fourth or fifth, as it is now.

FOREIGN NEWS IN BRIEF

Australasia

Part of the new defense program decided upon by the Federal Ministry includes the establishment of a seaplane squadron of 18 units, with additional expenditures made for equipment and a service base. More than $115,000 will be spent on new hangar accommodations and other buildings necessary for the Air Force expansion.

KING ISLAND has been included as a regular port of call on the Melbourne-Launceston air mail route, while air mail service to White Marks, Flinders Island, was discontinued.

BIDS FOR a seaplane service in New Guinea have been called for by the Government. It is felt that such a service would prove of great value to the Administration.

Canada

Plans for a new airport for Winnipeg, entailing the construction of a huge artificial lake, two miles in diameter, within seven miles of the city, have been announced. A committee of representatives from the Industrial Development Board, the Board of Trade and the Aviation League is working on the project.

ONE OF the first contracts awarded to the Cariboo-Bridge River Airways will be for the transportation of mining equipment, and if present plans materialize, the company's rebuilt Fairchild will fly complete machinery, compressor unit, drills, tools, and supplies for the development of a new gold property now in the prospect stage.

AT THE annual meeting of the Air Pilots, Engineers and Navigators Association, A. J. Richardson was elected president for the ensuing year. This organization was incorporated in 1929 and has steadily progressed to a membership now totaling 68. During the past year, 18 new members were enrolled. The club has done a great deal of good work in advancing the industry in western Canada. Chief among its aims is to protect the flying public and regulate all matters pertaining to air transport and a sane and equalized advance of aviation in the Dominion.

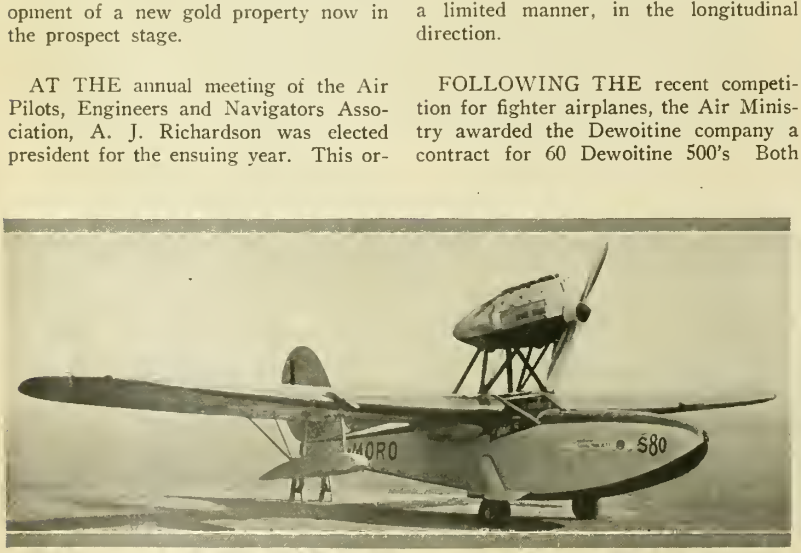
PACIFIC AIRWAYS, Ltd., and Wells Air Transport have resumed the Vancouver-Victoria air service, operating jointly from Wells Air Harbor. Two planes are alternating on the run, one an all-metal six-place Junkers, the other a Boeing flying boat. Both accommodate five passengers.

REGULAR WINTER air mail service between Quebec and Seven Islands will be extended to Havre St. Pierre and Natashquan. Special cachets are being issued to commemorate the inauguration of the extension of the airline.

France

Exhaustive experiments on a Farman-169 equipped with an oleo-pneumatic flotation gear have revealed some interesting aerodynamic results. During the tests, made in a severe wind and in a choppy sea, it was found that the rolling motion was absorbed, the effect of the waves was considerably reduced and take-offs were made in relatively short runs. The new floats can accomplish a parallel displacement in the vertical direction as well as rotations in the transverse axis and, in a limited manner, in the longitudinal direction.

FOLLOWING THE recent competition for fighter airplanes, the Air Ministry awarded the Dewoitine company a contract for 60 Dewoitine 500's Both Dewoitine and Liore & Olivier will concentrate on the production of the order.



Savoia-Marchetti S-80 amphibion with a Colombo S-63 engine

THE BERNARD 81-GR, specially designed for long distance flights and being prepared for an attempt at the long-distance record, has been powered by a geared Gnome K-14 engine.

PIERRE COT, Air Minister has completed his cabinet with the appointment of Daniel Hagenau, Director of the Cabinet; M. Moulin, chief of the cabinet; M. Corbin, Director at the Air Ministry; M. Georges Auray and Charles Bibou for special missions and Lt. Col. Jauneaud and Major Lamontagne, in charge of military affairs.

A MERGER of considerable proportions appears to be imminent in France. From all indications Breguet, Morana, Hanriot and Couzinet apparently are headed toward a consolidation, but no definite word has been received as to whether or not such a combine will take place. Under the French Air Ministry, there has been a decided tendency in the past few months to foster merges between large aeronautical groups, one of the most recent results being the creation of the Air Union as a combination of a number of outstanding airline companies.

Great Britain

Another link in the chain of airlines which will ultimately provide regular air service to all parts of the British Empire, was forged with the departure of the Indian air mail from London recently. A new 1500-mile extension from Rangoon to Singapore now makes possible a flight from London to China via Egypt, Karachi, Calcutta and Rangoon. Imperial Airways, Ltd., is operating the new extension as well as the rest of the airline.

THE SUPERMARINE S-5 which won the Schneider Trophy for England at Venice in 1927, and in which Flight Lieut. Webster later made a world's speed record of 281.49 m.p.h., is being broken up in a scrap metal yard in Manchester.

BRITISH AIR Transport, Ltd., will probably move its activities from Croydon Airdrome to the new South Nutfield Airport this summer to operate a taxi service and flying school. Instruction activities have been prohibited at Croydon due to the large amount of airline operations.

AFTER SEVEN years of experimental work and development, the Bristol company has introduced its sleeve-valve, nine-cylinder, radial, air-cooled aircraft engine. Several thousand hours have been piled up in bench tests and the engine is now undergoing flight tests with very satisfactory results being shown thus far.

THE PORTUGUESE Government has placed an order for a number of Hawker "Fury" single-seater biplane high-speed fighters, powered by Rolls-Royce Kestrel 525 h.p. engines. The "Fury" has a top speed of 215 m.p.h. at 15,000 feet and can climb, with full load, to 20,000 feet in less than ten minutes. A modified "Fury" shown recently was capable of attaining a speed of 250 miles an hour.

A NEW and interesting addition to the ranks of small British cabin light planes is the Avro Cadet, a modification of an open cockpit biplane of the same name. The ship conforms to standard Avro construction, with welded steel tubes playing a major part in the framework.

Italy

Official dedication of the field situated on a slope at the extremity of Genoa's harbor, in the immediate vicinity of the Genoa Seaplane Base has taken place. In the shape of a rectangle, the airport has an area 1,281 by 261 feet.

A NEW speed record for seaplanes over a 100 km. course was established by Lieut. Col. Guglielmo Cassinelli who, in a Macchi C.72, 2,400-horsepower plane attained a speed of 629.370 km. p.h. The former record was held by Lieut. Boothman of Great Britain at 551.8 kms. p.h.

GLIDER FLYING has taken on an encouraging outlook with the number of flights increasing. Especially fine reresults were obtained recently with the Balestruccio, Ballerina and Superbalestruccio gliders made by Ing. Bonomi and with the Roma made by Ing. Morei of Varese.

NEW APPOINTMENTS by Premier Mussolini in the Italian Air Ministry include Colonel Stanzani, Director of the Domaine Department, Colonel Felice Porro, Director of the Materiel and Airport Services and Colonel Stefano Cagna and Lieut. Tassotti, assigned for duty with the Air Marshal.

THE TRI-MOTORED Savoia Marchetti S-66-3 Flying Boats, designed to carry 18 passengers at a cruising speed of 136 m. p. h., have been put into service on the maritime routes of Societa Aerea Mediterranea and on the Rome-Naples-Syracuse-Malta-Tripolis connections of Stá Anonima di Navigazione Aerea.

FURIO NICLOT, flying a light, single-place seaplane built by Compagnia Nazionale Aeronautica, broke the world's altitude record for planes of the second category in the seaplane division, by reaching 27,595 feet. The previous record, established by the German flier Zimmerman, was 18,542 feet.

THE BIBESCU TROPHY for 1933 has been awarded to Italy following the Rome-Bucharest flight by Capt. Baldi and Lieut. Buffa at an average speed of 356 kms. per hour.

Mexico

A semi-weekly passenger, mail and express service is now operating on an experimental basis between Merida and Payo Obispo. Francisco T. Mancilla is the operator.

AIR EXCURSIONS from Mexico City to Acapulco, popular west coast port resort, are being offered by Transportes Aereos Mexicanos, S. A., on a weekly schedule which calls for four trips. The route is about 460 kilometers and the fare about $6.00.

BI-WEEKLY passenger, mail and express service has been established by Lineas Aereas de Pacifico between Mexico City and Guadalajara under the direction and ownership of Charles C. Baughan, American operator. Stops are also made at Morelia in Michoacan.

THE MINISTRY of War and Marine reports an increase in Mexican military and civil airports with 330 in operation as of August 31, 1933, compared with 220 on the same date a year ago. Other evidences of aviation progress in the country are seen in the establishment of 1,800 ground stations; in the repair of 27 Corsair, 15 Douglas, 21 other planes and 35 engines in the Ministry's Mexico City aviation shops and the logging of 3,203 hours of flight by the air forces of the first and second air regiments.

A PETITION has been presented to the Mexican Post Office Department by George Law and John McGuiness, American members of the Chihuahua City Aero Club for a concession to operate a mail service out of Chihuahua City to nine isolated towns in the high Sierra's on the borders of Sonora and Sinaloa. The fliers propose to provide semi-weekly service to the inhabitants who at present are getting their mail only once a month.

Russia

Aerial crop dusting has achieved a great degree of use and the utilization of airplanes to fight the plant pest has become increasingly important. During the first seven months of 1933, more than 329,000 hectares were dusted, while the fall sowing plan calls for seeding 160,500 hectares from the air.

THE MOST recent application of aviation in the USSR is in the field of propaganda and education. The First Flying Agitation Squadron was active in the last harvesting campaign, visiting many state and collective farms, bringing information and other aid to the peasants.

AIR AND water-cooled engines ranging from 65 to 700 horsepower are being developed in Russia. Experiments have been conducted on a series of air-cooled power plants designated as the SG-11, MG-21 and the MG-31, in all of which 95 per cent of parts are interchangeable.

MORE THAN 7,000 persons are now engaged in the construction of gliders. In the first five months of 1933, five new schools and 110 glider stations were opened providing a tremendous impetus to the art of powerless flight. At present, the Russians hold a number of unofficial world glider records including the altitude record at 2,230 meters; the duration record with passenger, 10 hours 56 minutes and the altitude record with a passenger, 1,945 meters. At a recent competition in Koktebel, Crimea, a Soviet glider with two passengers remained aloft for nine hours, while another was towed from Koktebel to Moscow, a distance of 5,000 kilometers.

STANAVO
AVIATION GASOLINE
AVIATION ENGINE OIL
ROCKER ARM GREASE

Philosophical Philadelphians

(*Continued from page* 19)

of praise, was rendered incomplete by the accident of its taking fire and being consumed in the air. Its rapid ascent to a very considerable height, and its beautiful appearance when elevated, justly excited the admiration of every beholder. Unfortunately the means employed for carrying a person up with it, were inadequate to the purpose, and no ways calculated for safety, or to inspire confidence."

Which I think was just as well, considering that it burned up. What delights me especially in this account of the gentlemen with the large elegant air balloon is that they were so courteous as not to continue their subscriptions while the stranger was making his experiment. We've changed considerably since those polite days, as any competing contractor for Army or Navy aircraft business will tell you. In fact, we've advanced so far that it is considered good ethics to throttle the competitor the moment he pops up.

The writer of the article, who was a bit of a critic, in a very polite way, remarks: "Without intending to detract from Mr. Carnes' ability, whose talents for philosophy are considerable, it must be allowed that the materials of which his Balloon was constructed were of too flimsy a texture, being made of silk that was no way strengthened by net-work, nor of any covering to make the attempt of carrying up a living person safe, as the event proved. Had Mr. Carnes been able to make it stronger, the probable success would have increased the pleasure of the numerous spectators."

And No Insurance!

I doubt that—unless people were different then. What could increase their pleasure more than to burn up the large and elegant balloon, as Mr. Carnes obligingly did? Just what Mr. Carnes' talents for philosophy had to do with his skill as a balloon builder is not clear to me, unless it means that, being a talented philosopher, Mr. Carnes could watch his burning balloon, shrug his shoulders, and remark, "What the hell!—it's all in a day's ballooning at Philadelphia in 1784."

But you haven't heard the worst of Mr. Carnes' large and elegant air balloon. According to the critical reporter, A. B. C., the ascent took place from a prison yard, and a man was aboard the craft, the air of which was heated by a furnace suspended beneath an opening in the bag. "The furnace, it is said, weighed above 150 lbs. was capable of raising from the ground a man weighing 150 lbs. or more. But being clogged with a quantity of bed-tick, a great number of patches, and other incumbrances, and having many holes, it performed that task with difficulty. It is probable the furnace was charged with too much wood, and too intense a flame was thereby kindled. That circumstance, or the spilling of some coals by the canting over of the furnace in mounting above the wall of the Prison-yard, against which the person to be raised struck and fell (as some alleged) were the probable causes of the balloon taking fire and being consumed."

The art of reporting at that time evidently had not advanced much ahead of the art of ballooning. A. B. C. entirely misses the drama of the incident, and leaves to our imagination the picture of the early Philadelphian being smashed up against the prison wall while balloon, bed-tick, patches, furnace and all go up in flames. Anyhow, that finished not only the large and elegant air balloon, but Mr. Carnes as well, for he returned to Maryland, gave up ballooning for philosophy, and thus doubtless lived to a ripe old age, like all philosophers.

The critic ends his account with a plea for support of the Subscription Balloon, which is guaranteed to be superior in every way to Mr. Carnes' elegant fire trap and automatic passenger ejector. He says folks can subscribe any small amount, such as they would pay to see a play or to buy a dinner. "Surely," he pleads, "such an enjoyment" (as the play or the dinner), "as cannot boast the refined pleasure which arises from a view of the before hidden operations of Nature brought to light, and a contemplation of the wisdom and beneficence of the great Creator of the world to man, is not to be compared to the solid entreatment the proposed design will yield to a rational mind. This affords an opportunity to all well-disposed persons who wish to encourage philosophy and found learning in the rising generation, to manifest the preference they give of the adorning the minds of youth with substantial information, to the mere external decoration of dress or trivial amusements."

Whether the well-disposed and philosophical citizens of Philadelphia ever subscribed to the Balloon is a question that is hidden in the lost files of the Pennsylvania Packet and General Advertiser, the AERO DIGEST of its day, complete with aviation writer who attended balloon ascensions.

Judging by what I have observed of Philadelphia to-day, I should say off-hand that they did not subscribe, and that the proposed large and elegant balloon never went up. If it did, it is up to some Philadelphian to prove the fact, for the greater honor and glory of his practically defunct burg. If he can find later numbers of the Pennsylvania Packet in which ballooning is reported, I'd like to examine them.

Social Notices

I was greatly interested in the advertisements, such as "High Proof Antigua Rum, and Muscovago Sugar, Imported and to be sold by Johnathan Rumford & Abijah Dawes, at their store in Water street. They have also for sale, Black Pepper, Sail Duck, and a quantity of Junk." I don't care about the black pepper, the sail cloth, or even the junk. But I would like to know more about that Rum.

And it is strange that in a country that had just fought a war for liberty and the rights of man, as it was said, an advertisement such as this one should strike no ironical note, but on the contrary to be accepted as a business notice: "To be Sold, a young, healthy, strong and likely Negro Wench, she is sober and honest, has had the measles and small pox, can cook, wash, and iron, and do all kinds of housework, she is fit either for the town or country."

And if you think Negroes were the only slaves in this "free country" read this: "Twelve Dollars Reward. Ran-Away from the Subscriber on Sunday last, an English servant MAN, named Thomas Hodgson, aged about 25 years. Whoever takes up said Servant, and confines him in any jail, shall have the above reward." Well Philadelphia *has* advanced, even though it gave up ballooning and took to Pinchot and Vare.

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(*Continued from page* 31)

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Aero Club Moves Quarters

AT A recent meeting of the Aero Club of Pennsylvania it was announced that the club will maintain headquarters in the New Franklin Memorial and Franklin Institute Museum Building on Philadelphia's Parkway to enable officers and members to work in closer collaboration with the institute in the maintenance and development of its aviation displays.

ADVERTISERS' LITERATURE

THIS service is for the convenience of those **who are in the market** for any of the products or facilities advertised in this issue. Read carefully the advertising of the items listed below in which you are interested, to determine whether the information offered is what you need.

AIRCRAFT

1. Potential light plane owners, be sure to investigate Aeronca's new cockpit heater (*Page* 59)

2. The Bellanca literature will prove interesting to commercial operators and private fliers who are looking for economical aerial transportation. (*Page* 11)

3. Aircraft operators, airlines particularly, are requested to write (on their letterheads) for the literature describing Douglas aircraft. (*Page* 4)

4. Potential plane owners in the West, let Pacific Aircraft Sales furnish you with literature on Fairchild aircraft. (*Page* 31)

5. Dealers, operators, private fliers—let Fairchild send you complete details of their line of "22" and "24" open and closed aircraft. (*Page* 29)

ENGINES

6. Engineers, operators and manufacturers — Wright Aeronautical Corp. will be pleased to send you their technical literature on Wright liquid- and air-cooled engines. (*Pages* 8 *and* 9)

7. Aircraft manufacturers and engineers are invited to write for the Pratt & Whitney engine literature. (*Second Cover*)

AIRCRAFT AND ENGINE EQUIPM'T

8. Flightex Fabric — "Famous Flying Fabric"—literature is available to manufacturers, operators, dealers and repair stations. (*Page* 3)

9. Engine and plane manufacturers, aeronautical engineers, let SKF Industries mail you specifications and other data concerning SKF bearings. (*Page* 1)

10. Airline operators, the Sperry Gyroscope Co. literature should be handy in your reference files. (*Page* 7)

36. Pittsburgh Plate Glass literature contains helpful data on aircraft finishing. (*Page* 31)

11. Before placing your order for aircraft engine valves, get a copy of the Thompson valve literature. (*Third Cover*)

12. Before buying your new spark plugs, obtain a copy of the new H-T booklet. (*Page* 59)

13. Airlines and other users of controllable pitch propellers will find the Hamilton Standard literature a handy reference. (*Page* 23)

14. A new instrument — combining an artificial horizon and turn-bank indicator—is described and illustrated in the Huntington Instrument Company's literature. (*Page* 33)

15. Engineers, maintenance men, manufacturers — get a copy of the Wittek Hose Clamp literature. (*Page* 57)

16. The Aeromarine Instrument catalog contains complete descriptions of a variety of precision-built aircraft instruments. (*Page* 31)

17. For aircraft finishers (and refinishers) Berry Bros.' catalog of colors, methods, etc., will be particularly helpful. (*Page* 57)

18. Aircraft manufacturers, let National Tube Co. send you literature on National Shelby aircraft tubing. (*Page* 45)

19. Aircraft owners and operators, let the B. G. Corporation send you their interesting booklet on spark plugs. (*Page* 2)

MISCELLANEOUS

20. Airport Managers: American Sheet & Tin Plate Co. has interesting data relative to the construction of hangars, sheds, culverts, etc. (*Page* 51)

21. Manufacturers and operators should have the Eclipse starter and generator data handy. (*Back Cover*)

22. Ronald Press literature outlines the entire line of Ronald Press technical aeronautical books. (*Page* 72)

23. Westport introduces a new airport radio—complete description is available for the asking. (*Page* 58)

24. Racing and stunt pilots—get in touch with the Miami Air Race Committee. (*Page* 61)

25. For bargains in various flying supplies, write for the Johnson Airplane and Supply Co. catalog. (*Page* 57)

SCHOOLS

26. Parks Air College, in offering prospective students a copy of "Skyward Ho!" tells the complete story of Parks training. (*Page* 5)

27. The Penn School of Aviation, affiliated with Pennsylvania Airlines and Pittsburgh Aviation Industries, offers literature describing in detail its ground and flying courses. (*Page* 45)

28. The Roosevelt Aviation School offers prospective students complete literature, including prices, etc. (*Page* 51)

29. For training in the West —write for the latest Ryan School catalog. (*Page* 64)

30. Spartan School, home of the "Dawn Patrol," is interested in sending their latest literature to pilots- and mechanics-to-be. (*Page* 35)

31. The United Schools of Aeronautics, operating from Valley Stream, N. Y., have an interesting story to tell pilots- and mechanics-to-be. (*Page* 59)

32. Dallas Aviation School, Dallas, Texas, invites prospective school students to write for latest literature. (*Page* 10)

33. The Lincoln School literature will interest mechanics and flying students. (*Page* 61)

34. The Casey Jones School, specializing in mechanics and engineering training, suggests that prospective students write for their descriptive literature. (*Page* 60)

35. For excellent training in flight, mechanics or administrative courses, write for the Boeing School Bulletin. (*Page* 57)

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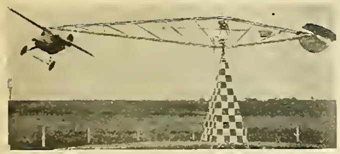

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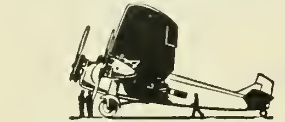

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BOEING 2-place Army observation ship, late model, Liberty-powered: recovered and A-1, real performance, license. Sell cheap or trade. Want J-5 motor. AERO DIGEST, Box 1680.

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WHITTELSEY AVIAN: Cirrus III. Excellent condition. Motor recently overhauled. Licensed until July 1934. For sale, $800, cash only, or trade for seaplane. George du Manoir, 4354 Alton Road, Miami Beach, Florida.

LICENSED FAIRCHILD five-place cabin monoplane. Cost $14,000. Recently recovered. Splendid condition. Ideal for surveys and passenger work. Cash bargain. Fred Block, Peoria, Illinois.

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Used Planes and Engines

FOR SALE: OX Robin; 46 hours, new covering, just relicensed. Metal prop, Bosch magneto. Might trade. Ray B. Vaughan, Box 490 A, R.D. No. 5, Akron, Ohio.

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FOR SALE: Boeing pursuit, Arrow Sport, Buhl Bull Pup, Bellanca, Kinner Bird, Fleet, Challenger Travel Air, J-6-7 Travel Air, J-5 Ford, Lockheed Vega, Lockheed Sirius, Lambert Monocoupe, Challenger Robin, J-6-9 Ryan, Sikorsky S-38 and S-39, Stinson Jr., Verville Trainer, J-6-5 Travel Air. Aircraft Sales Co., Hangar "D", Roosevelt Field, Mineola, N. Y.

PARKS TRAINER: 3-place; licensed to September 1934. Motor and ship in excellent condition. OX-5 Millerized. Covering A-1 condition. Cash, $390. May consider trade. Ray Herziger, 1228 Superior Avenue, Sheboygan, Wisconsin.

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FOR SALE: Argo biplane, good condition, license expired October. Always hangared, privately owned. A sacrifice. Write or wire Walter Fitch, Seventh Street, Coshocton, Ohio.

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DON'T BUY ANYTHING until you get Ort's 1934 Aviation Material Catalog. Prices are lower. Send one thin dime today. Karl Ort, 526 W. Poplar St., York, Penna.

UNIVERSAL PROPELLERS give better performance at lower cost. OX-5's, $19.95; LeBlond's and Velie's, $18.85; Szekely and Continental, $15.75. Manufactured of selected hardwood, faultlessly glued, copper tipped, and accurately balanced. Small propellers for sleds and sport planes, $3.98 and up. Hibbs, Fort Worth, Texas.

DISTANCE TEMPERATURE gauges, $2.50; safety belts, 95c; fur-lined flying suits, $9.87; 200 assorted aircraft bolts, $1.95; Snugfit goggles, $2.48; oil pressure gauges, 66c; Johns-Manville tachometers, $3.87; Dixie magneto switches, 49c; 2 inch pinked tape (200 yard roll), $1.95; Rieker pitch and bank indicators, $2.92. Karl Ort, 500 W. Poplar St., York, Penna.

CONTROLLABLE PITCH propellers: Two specially designed for racing. One Smith for Wasp, Jr. One Hamilton for Wasp. Factory reconditioned. Like new in every respect. Granville, Miller & DeLackner, 101 Park Avenue, New York City. Telephone: Caledonia 5-9231.

$250 BUYS woodworking machinery for approved shop. Bandsaw, tablesaw, planer, pointer, shafting, counter-shafting, belts; heavy machinery, excellent condition. Yankee Aero Parts, New Canaan, Connecticut.

CLEAR ACETATE DOPE in barrels, 65c per gallon. Clear acetate dope in 5-gallon cans, 80c per gallon. Clear nitrate dope in 10-gallon cans, $1.40 per gallon. Yellow pigmented nitrate dope, any quantity, 85c per gallon. Good strong commercial airplane fabric, 27c per yard. Plywood, 10c per sq. ft. and up. Karl Ort, 505 W. Poplar St., York, Pennsylvania.

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MIDWINTER CLEARANCE sale of wings for Waco Ten, Waco Cabin, American Eagle, Travel Air, Lincoln-Page and others. Write us your needs. Prices reasonable. New London Aircraft Co., New London, Ohio.

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WILL TRADE 1930 Hudson super eight sedan, good paint, tires and upholstery, smooth running motor. Will trade for two- or three-place licensed plane. Willard Waite, Route 1, Camanche, Iowa.

WANTED: Crankshaft for Aeronca E-107 motor (not E-107A). Also want Aeronca, Salmson AD-9 or other good 30-40 h.p. motor. A. C. Fowler, Hurricane, West Virginia.

WANTED: Late model Great Lakes, or Monocoupe. Will consider ship needing repairs or recovering. Must be bargain. A. J. Leeward, 1255 Taylor, New Kensington, Pennsylvania.

IF YOU HAVE AN AIRPLANE for sale, less than $1,500 or reasonably priced OX ship, regardless of make, condition or location, write Owners Aircraft Sales, 97 May Avenue, Athens, Ohio.

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WANTED FOR CASH: J-5 engine, J-5 Heywood starter. Three OX-5 motors and parts for sale or trade for above. Roger Mensing, 1218 Jones St., Fort Wayne, Indiana.

WANTED: An OXX-6 motor. Prefer one that needs overhauling. State best price for cash. Wilbur J. Irwin, 5945 Greenview Avenue, Chicago, Illinois.

WANTED: Ships built for Kinner K5 motor. Any condition. With or without motor. Also will sell or trade Warner Cessna, Gipsy Moth, Floyd Smith parachute. John D. Jacob, Malvern, Pa.

CASH FOR used, cracked airplanes, parts. State lowest price, details. Box 172, Oak Park, Illinois.

HAVE CASH for new or slightly used 45 horsepower Szekely motor. State motor number. Price must be reasonable. John Osterhouse, Mandan, North Dakota.

HAVE CASH for modern planes up to 300 h.p., open or closed; any condition. Give details and price in first letter. AERO DIGEST, Box 1683.

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WANTED AT ONCE: Financial assistance for passenger, freight and express line connecting with American Airways, United Air Lines, Transcontinental & Western Air, Inc., Northwest Airways, and Eastern Air Transport. Complete details will be mailed only to responsible persons in a position to help finance and operate this organization. AERO DIGEST, Box 1682.

ATTENTION: Plane owners—Cash for late cabin and open ships. Also Warner motors. What have you? We buy, sell and trade. Write for list of bargains. Omaha Aircraft Brokerage Service, South Omaha, Nebraska.

$600 CASH FOR licensed Waco, Travel Air, Bird, Fleet or similar ship, 100 h.p. or more. Must be a bargain, no junk wanted. All letters answered. Box 397, Clifton, Texas.

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PARACHUTES: Approved type. Seat, back, lap and chest; bought and sold; exchanged, repaired. Tell all first letter. Professional parachute jumpers and balloonists furnished for all occasions. Thompson Brothers Balloon and Parachute Co., Aurora, Illinois. Established 1903. Winter Quarters, Orlando, Florida.

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ENGINEER: 4 years' experience. B. S. degree. Experienced in airplane drafting, design and stress analysis. Has just finished a complete analysis which has been approved. Minimum salary for permanent connection. Available immediately. George Barton, Albany, Wisconsin.

LET ME FLY YOUR SHIP. Go anywhere, but rather fly Fleet or Stinson for rancher. L. C. license. Experience on both. Jeff King, Kopperl, Texas.

A & E GRADUATE: 28, eight years' mechanical experience; electric and acetylene welder; desires position connected with aviation. References; salary secondary; go anywhere. Box 212, Fallon, Nevada.

YOUNG MAN: 19, A & E graduate of Curtiss-Wright school, desires position to finish year necessary to get licensed. State salary. References, diploma. AERO DIGEST, Box 1679.

YOUNG MAN: 27, Limited Commercial student, free February 5. Mechanical and drafting experience. Go anywhere. Wages immaterial. Good worker. George Stevens, c/o Spartan School, Tulsa, Oklahoma.

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Principles of Flight: Explains all the essential aerodynamic factors and their application to airfoils.

Airplane Construction and Operation: Principles of construction and materials employed. Methods for working wood and fabric. Welding metal planes and parts. Flying. Elementary acrobatics.

Propellers: Theory. Construction and maintenance of wood and metal propellers. Variable pitch propellers.

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Blind Flying Instruments: Use of attitude instruments in blind flying. Absolute and relative references. Inclinometers. Pitch, roll, turn indicators. Operating principles of gyroscopic instruments.

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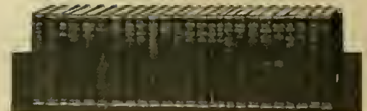

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MAKING HISTORY

IN THE AIR•

SPEED

(World's land-plane record) 316.55 miles per hour, Chicago, September, 1933, 3 kilometer course, Pilot James R. Wedell, flying a Wedell-Williams Special, engine 800 h.p. Wasp.

ALTITUDE

World's record June, 1930, 43,166 feet, Pilot Lieut. Soucek, U. S. Navy, Wright Apache biplane, 9 cyl. Pratt & Whitney Wasp engine.

DISTANCE

Around the world, 15,000 miles, seven days-18 hours-49½ minutes, July, 1933, Pilot Wiley Post, Lockheed-Vega Monoplane "Winnie-Mae." 550 h.p. Wasp motor.

ENDURANCE

World's non-stop refueling endurance record, 647 hours, St. Louis, August 17, 1930, Pilots Dale Jackson and Forrest O'Brine. Plane "The Greater St. Louis." Motor 190 h.p., six cylinder, Curtiss Challenger.

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Thompson Valves

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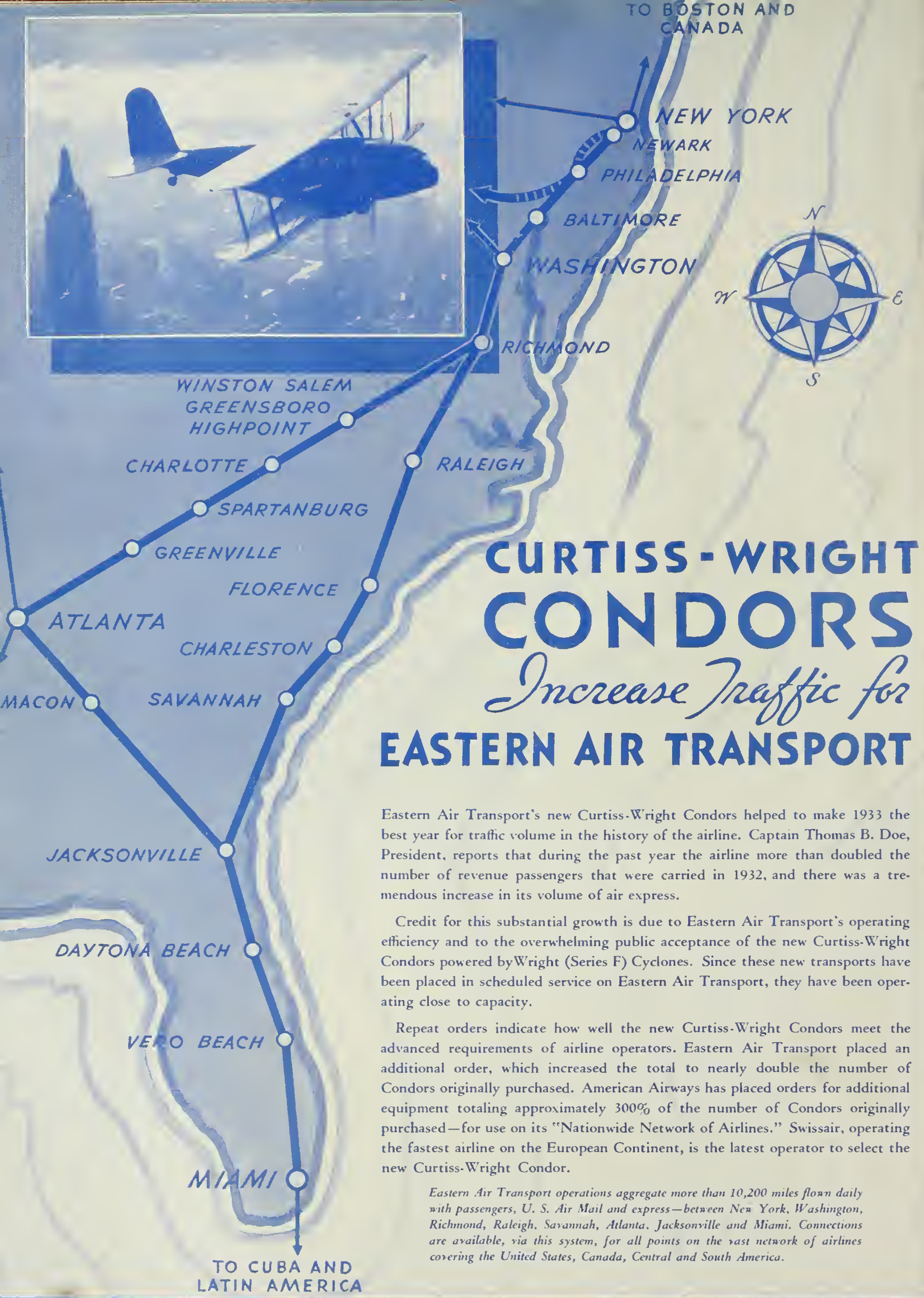

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Increase Traffic for

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Eastern Air Transport's new Curtiss-Wright Condors helped to make 1933 the best year for traffic volume in the history of the airline. Captain Thomas B. Doe, President, reports that during the past year the airline more than doubled the number of revenue passengers that were carried in 1932, and there was a tremendous increase in its volume of air express.

Credit for this substantial growth is due to Eastern Air Transport's operating efficiency and to the overwhelming public acceptance of the new Curtiss-Wright Condors powered by Wright (Series F) Cyclones. Since these new transports have been placed in scheduled service on Eastern Air Transport, they have been operating close to capacity.

Repeat orders indicate how well the new Curtiss-Wright Condors meet the advanced requirements of airline operators. Eastern Air Transport placed an additional order, which increased the total to nearly double the number of Condors originally purchased. American Airways has placed orders for additional equipment totaling approximately 300% of the number of Condors originally purchased—for use on its "Nationwide Network of Airlines." Swissair, operating the fastest airline on the European Continent, is the latest operator to select the new Curtiss-Wright Condor.

Eastern Air Transport operations aggregate more than 10,200 miles flown daily with passengers, U. S. Air Mail and express—between New York, Washington, Richmond, Raleigh, Savannah, Atlanta, Jacksonville and Miami. Connections are available, via this system, for all points on the vast network of airlines covering the United States, Canada, Central and South America.

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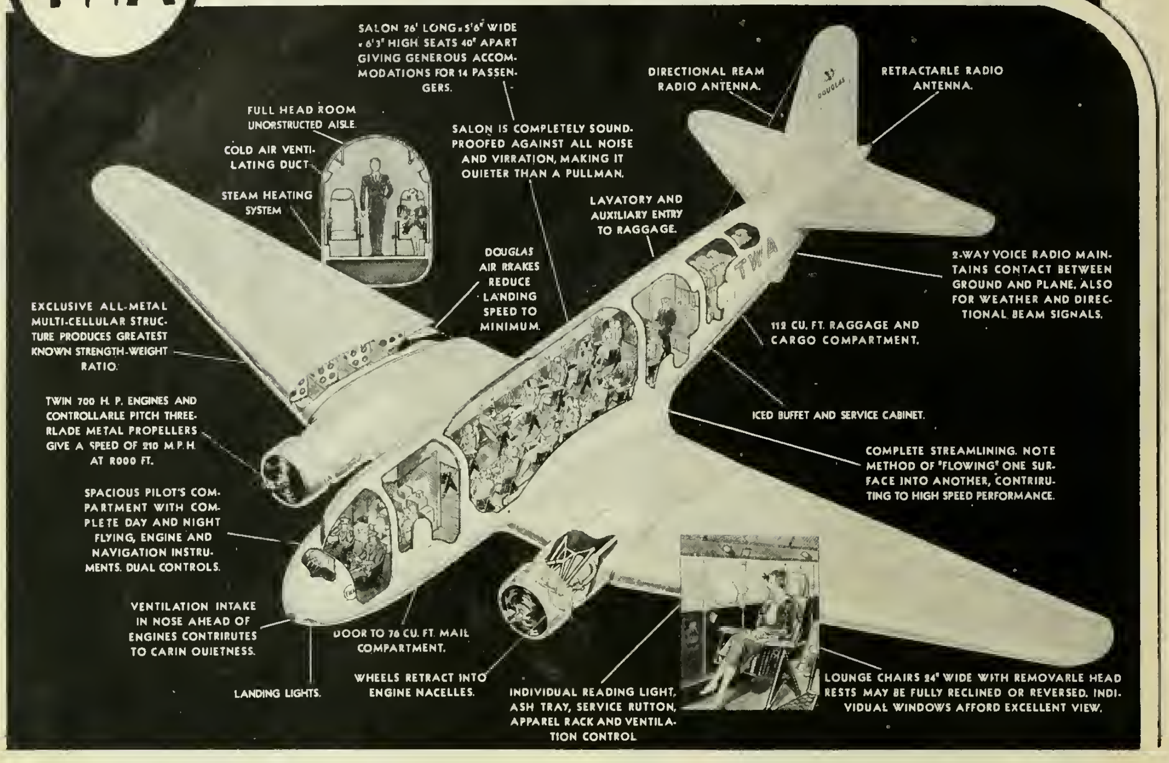
RCA Victor Co., Inc.

CAMDEN, N. J.

"Radio Headquarters"

Aero Digest, *February*, 1934 *Volume* 24. *Number* 2. *Published monthly by Aeronautical Digest Publishing Corp., at 515 Madison Ave., New York, N. Y. Yearly subscription, $3. Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 1879.*

TWA DOUGLAS AIRLINER


SALON 26' LONG × 5'6" WIDE × 6'3" HIGH. SEATS 40" APART GIVING GENEROUS ACCOMMODATIONS FOR 14 PASSENGERS.
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TWIN 700 H. P. ENGINES AND CONTROLLABLE PITCH THREE-BLADE METAL PROPELLERS GIVE A SPEED OF 210 M.P.H. AT 8000 FT.
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EDO'S COME HOME
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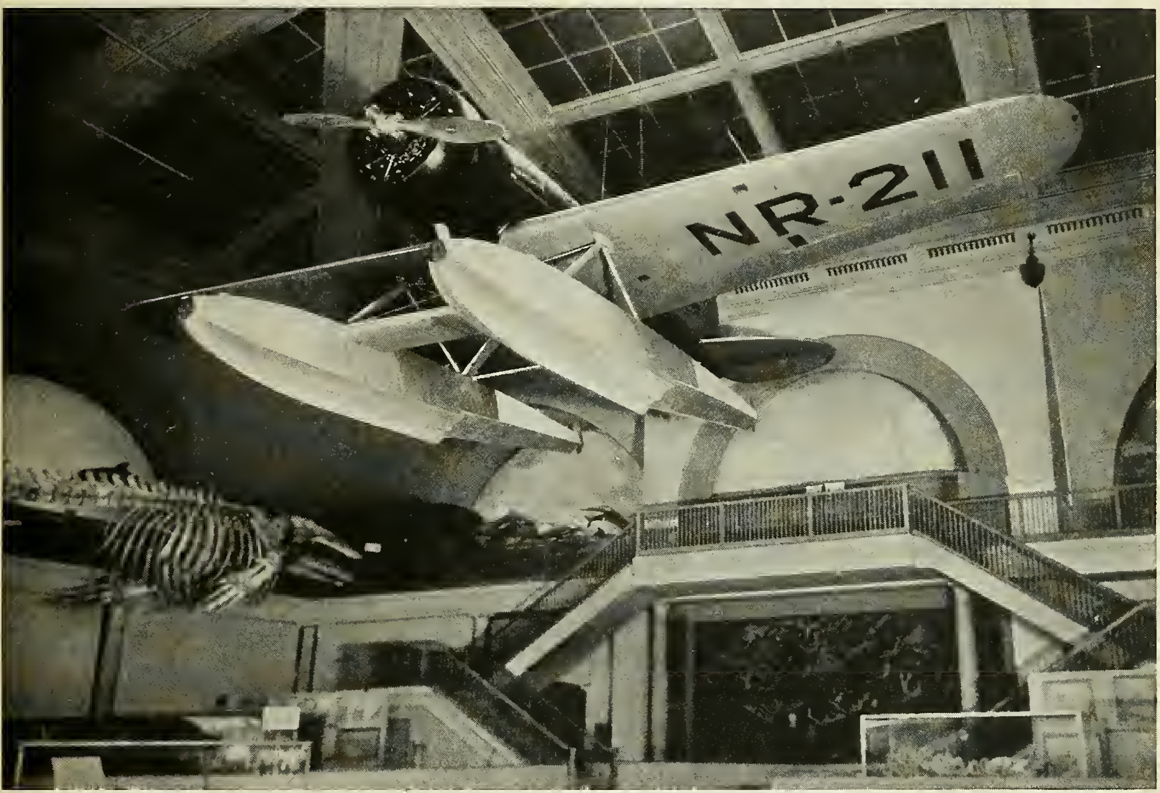


★ This Exploration Exhibit was presented to the American Museum of Natural History by Col. and Mrs. Charles A. Lindbergh. Their Lockheed seaplane on Edo floats is a noteworthy example of the equipment which is ever broadening the range of aerial commerce, where the water's surface is the starting point and the destination.

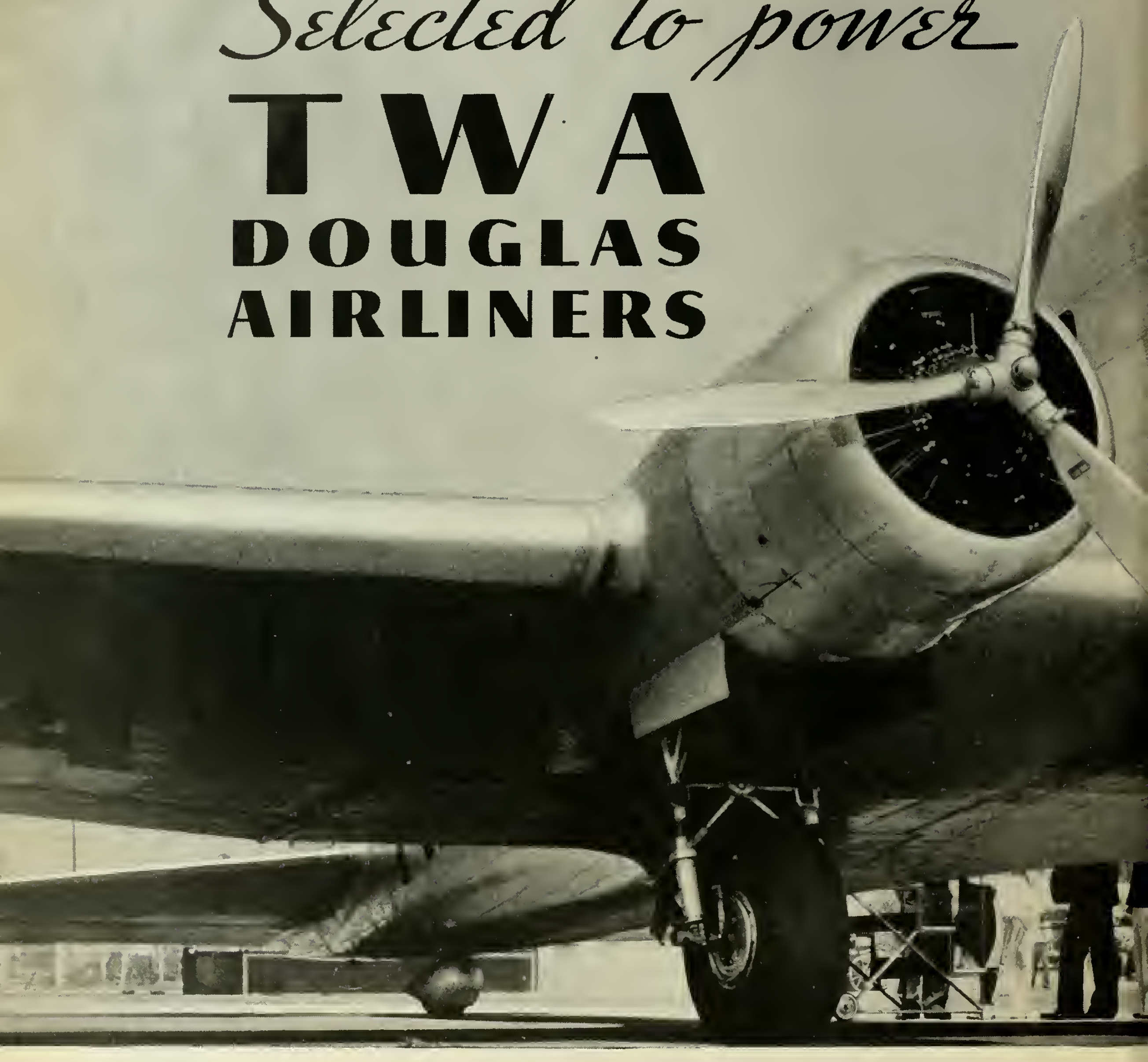
These Edo all-metal floats have spanned oceans and linked five continents in 41,000 miles of exploration flight. They left their wake in the ice-rimmed bays of the Arctic, on far Oriental seas, over busy European harbors, and in the turbid waters of the mighty Amazon. They performed the most difficult tasks with the smooth regularity which is one with their efficient design and rugged construction. Now they are retired from high service, still competent for duties of like magnitude. Edo Aircraft Corp., 610 Second St., College Point, Long Island, N.Y.

★

EDO INCIDENT: At Bathurst, British South Africa, Col. Lindbergh successfully negotiated a take-off at a gross weight of 7699 pounds—a wing load of 29 lbs. per sq. ft. and 10.8 lbs. per h.p. His Edo floats (standard model 6075) functioned under these severe conditions with their normal 90% reserve buoyancy reduced by the overload to a minimum of 58%.

★ ★

WRIGHT CYCLONES
Selected to power
TWA
DOUGLAS AIRLINERS



Transcontinental & Western Air's new, all-metal Douglas Airliners will be powered by Wright (Series F) Cyclones. These Luxury-Airliners, scheduled to be placed in service this spring on "The Lindbergh Line," will reduce TWA's flying time from coast to coast to less than 18 hours. This announcement is of commanding importance to the aeronautical world, because it represents the largest purchase of new equipment by any of the world's leading airlines.

TWA's technical staff selected Wright Cyclones after exhaustive tests which many experts in the aviation industry believed impossible to pass. One of these tests included a "single-engine" take-off, with a full load of 17,500 lbs., from Winslow, Arizona (4,500 feet above sea level). On this test the pilot deliberately shut off one engine when the plane had traveled 2,200 feet down the runway. The plane continued its take-off and climbed to an altitude of 9,000 feet, where the pilot leveled off and flew over the Continental Divide to Albuquerque, New Mexico—240 miles distant. A speed of 120 m.p.h., on one engine, was maintained throughout the flight.

High altitude tests were made around 20,000 feet to determine how the Wright Cyclones would function in the sub-stratosphere, in line with plans which are now being developed by TWA for the high alti-

217 MILES AN HOUR

A speed of 217 miles an hour at 8,000 feet altitude, a landing speed of less than 60 miles an hour and a passenger cabin quieter than a Pullman are features of the new TWA Douglas Luxury Airliners.

240 MILES ON ONE ENGINE

At Winslow, Arizona (4,500 feet above sea level), the pilot deliberately shut off one engine when the plane had traveled 2,200 feet down the runway. The plane continued its take-off on one engine, climbed to 9,000 feet and flew to Albuquerque, New Mexico — a distance of 240 miles—at an average speed of 120 m.p.h. on a single engine.

CYCLONES DEVELOP 1430 H. P.

The two supercharged Wright Cyclone Engines of the TWA Douglas Airliner develop 1430 h. p. at 8,000 feet altitude. The enormous cabin of this modern transport offers the ultimate in luxury and comfort for fourteen passengers.

tude flying of the future. Other tests included a full-throttle climb from sea level to 20,000 feet in 24 minutes; and a one-engine climb, with full gross load, from 6,000 feet to 8,000 feet in 10 minutes.

More than 170 hours of flying time were required to make these gruelling tests, which indicates how thoroughly they were conducted by TWA's technical staff. The outstanding performance of the Wright Engines culminated in the decision to have the Douglas Airliners powered by Wright (Series F) Cyclones.

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Kendall Oil gave me the utmost in lubrication from start to finish. Although I ran my motor at high speed for the entire trip, never once did the temperature rise after it had gained a normal running point.

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My motor has now been torn down for major overhaul after approximately 700 flying hours, and I find it in excellent condition, a fact which speaks for itself as a recommendation of your product, as I have never used any other oil.

I contemplate doing another 700 hours of flying this coming year with my Waco Cabin and am looking forward to your oil to give me the same high efficiency as it has in the past.

Very truly yours,

WACO SALES of NEW YORK, INC.

Montgomery J. Chumbley
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THE 30 HOUR OIL

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—TIME, Vol. XV, No. 25, p. 52.

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Douglas Transport

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That is why so many commercial lines choose them. Socony-Vacuum double-range products include—Mobiloil Aero Oils, Mobilgrease, Aviation Mobilgas, Socony-Vacuum Instrument Oil and Socony-Vacuum Compass Fluid.

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CONGRATULATIONS TO OUR NAVY ALOFT AND AFLOAT

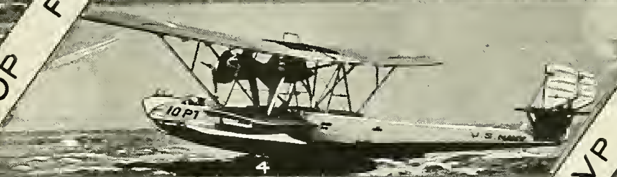
★ THE LONGEST NON-STOP FORMATION FLIGHT ON RECORD ★

1

2

3

1. Rear Admiral Ernest J. King, Chief of the Bureau of Aeronautics; 2. (left-to-right) Lt. Cam'd'r. K. McGinnis, in command of VP Squadron 10-F and his staff, Lt. Davis, Lt. McRoberts, Lt. Perry, Lt. Quinn, and Lt. Averill; 3. (left-to-right) Rear Admiral J. H. Holligan, Commander, Aircraft Battleforce, and Admiral David Sellers, Commander-in-Chief, United States Navy.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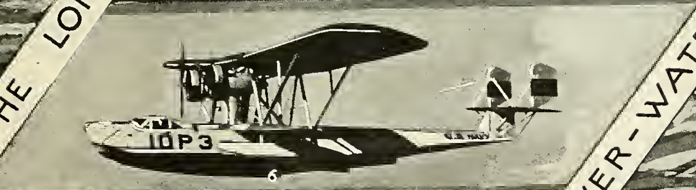
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4. The take-off of 10P-1, the flagship; 5. The Squadron flying over San Francisco Bay an its way to Hanalulu; 6. Somewhere over the broad Pacific; 7. The end of the flight, Pearl Harbor, Hanolulu . . . where the officers and crew were greeted by the wireless flash from Acting Secretary of the Navy, Colonel Henry S. Roosevelt: "WELL DONE . . . . . THE NAVY IS PROUD OF YOU."

7

★ THE 2400-MILE OVER-WATER HOP OF VP SQUADRON 10-F ★

CONSOLIDATED AIRCRAFT CORPORATION BUFFALO • NEW YORK

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WE ARE ALL SET FOR THE BIG 1934 "NEW DEAL"

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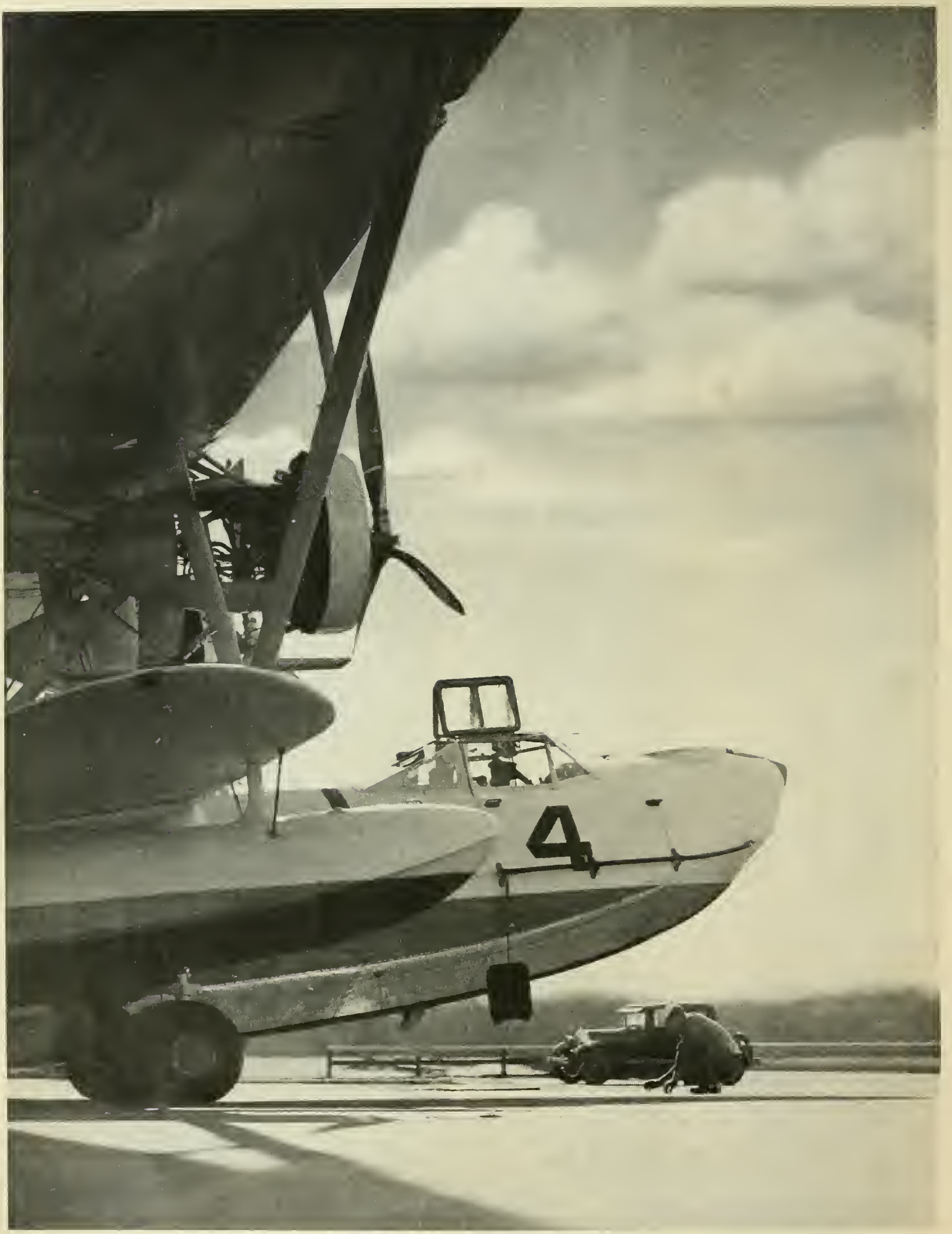


Checking the compass on one of the six Wright Cyclone-powered Consolidated Patrol Boats at San Francisco before their recent 2400-mile formation flight to Hawaii

AIR

Hot and Otherwise

FRANK A. TICHENOR

● Since 1928 this page has had something to say about ex-Postmaster General Walter Brown and air mail contracts. Here are a few quotations from various issues. This is what we said then. *What do you think now?* "Were we wrong or were we wrong!"

August 1929—"Walter F. Brown, Postmaster General, like a new college boy, is standing at the threshold of much education. He told the newspapers not long ago that Government payments to air mail contractors must be generally reduced. At a recent conference with the contractors, he complained because the Government has had to make up deficits. . . . ."

"Should a reduction in contractors' pay be found necessary, each contractor should be dealt with separately, with some consideration for the service he has rendered, and some thought about his necessary overhead expenses. A contractor who is carrying a few salaries of $25,000 or more may be doing so because some names will have a fine effect on sales of stock to the investing public. Stock market booms and busts don't really affect air mail efficiency.

"If, on the other hand, another contractor has operated without foolish overhead, it would be a nice thing, Mr. Brown, if you jotted down his name and number in your personal address book. Why penalize a contractor who has rendered service to the Government by keeping his costs down? Let that man who has done well go ahead and make a living. And be glad, not sorry, if it is a good one.

"If any one should happen to be on your staff who is working for the benefit of certain contractors by trying to drive others from the field, you'd like to know it—wouldn't you? Well, Mr. Brown, remember that a man in your position has to watch everyone, every day and night and minute. If you could only find out if any of your subordinates are speculating on the market, and at whose suggestion—that would be helpful information, too. 'Mr. X' on a stock broker's books has been a person of disaster to more than one man.

"A good man for you to talk with, Mr. Brown, is the Hon. Frank Hitchcock, once the occupant of that exalted eminence to which you have been raised. *He ran the Post Office Department without a deficit. . . .*"

January 1930—". . . There has been far too much politics in the awarding of air mail contracts, too many fights waged by contractors who have sought to hold what they have reckoned juicy contracts, with, in most instances, not enough honest-to-goodness effort to develop real air transport lines. . . ."

April 1930—"Much is wrong with the Post Office Department plans for the development of our Latin American air mail. The Post Office wishes to use the $1,500,000 asked from the Appropriations Committee of the House, not for the completion of the air mail service from Miami down the east coast of South America, as generally desired by our exporters, but for making west coast trips more frequently, extending slightly the Buenos Aires-Rio plans and establishing an airline penetrating Canada.

"This is an entirely unsatisfactory plan and the Post Office Department claims to the effect that South American needs are covered by the extension from Buenos Aires to Rio are not justified in fact. Such a scheme would provide a service so slow as to be useless in reaching Rio.

"There are several large cities north of Rio which, if touched, would give our business men much trade in a vast region wherein we now work at a great disadvantage because of imperfect mail facilities. Several large South American cities of this region will soon be placed by a French service nearer to Europe than our best plans will place them to our own United States. . . ."

September 1930—". . . The Watres Act made Walter F. Brown czar of the air mail, with almost as much power in his field as the late potentate of Russia had in his. Brown may have his reasons for slow motion, but inasmuch as he said in his address to the operators in early spring that the reason for canceling old contracts was "economy," we fail to understand how he can feel justified in a procedure which is as expensive as it is deliberate. For of course until the new certificates are handed 'round, the old rates (which he said were far too high) must continue in effect.

"Nor do we appreciate how aviation can be promoted by restricting the bidders for contracts to a few companies and thus confining the bidding for the manufacture of mail planes to just that few. We doubt if the authors of the law intended to give the Postmaster General power to select those companies which might bid on these contracts, and we also doubt the strict legality of his actually doing so.

"We have carefully watched all air mail operations both under Mr. Brown and under his predecessor, Harry New. At an early date we shall present an interesting story of these various transactions—a story which will enlighten and surprise a lot of taxpayers."

November 1930—". . . A few days after the award of the last transcontinental agreement, a new corporation was formed by Western Air Express, TAT-Maddux and Pittsburgh Aviation Industries in which Western Air Express has 47½ per cent interest, TAT 47½ per cent and Pittsburgh Aviation Industries five per cent. Harris Hanshue of Western Air Express, is president; and Clement M. Keys, of TAT, is chairman of the board. The contract which has been awarded makes mandatory stops at Philadelphia, Pittsburgh, Columbus, Indianapolis, St. Louis, Kansas City, Wichita, Amarillo and Albuquerque, with an alternative cut off route from St. Louis through Tulsa to Amarillo.

"Politics makes strange bedfellows and apparently Postmaster General Brown, who by some is conceded to be a good politician, has made some very queer ones among the air mail contractors. Only time, of course, can reveal eventual results. But if firm foundation exists for the ugly current rumors about the methods employed in forcing these contracts down the throats of the three organizations involved, it seems not impossible that even after all the long delay before the granting of awards the next Congress will find it desirable to scrutinize them very closely. . . ."

". . . The Postmaster General, today, has far greater powers than he should have, and rumors reach me from reliable sources that he has used and contemplates using them to the fullest degree.

"Maybe it will work out advantageously. I hope, for the good of the contractors, as well as for the best interests of the Government, that it will. But being an American of Irish extraction and speaking and drinking Scotch, 'I ha' me doots.'"

March 1931—". . . Less playing of Brown politics might have left a smaller deficit all along the postal service line, even in Air Mail. More Service to the public and greater fairness would improve the situation generally. . . ."

". . . What the public needs, Mr. Brown, is not less Air Mail but far less scheming. What the postal service needs more of, besides Air Mail, is business

(*Continued on page* 20)

Alice in Ballyhooland

●

CY CALDWELL

Those of my six kindly readers who sometimes embarrass me by reading too much serious meaning into my little essays are reminded that often these monographs are written merely for my own amusement and with the wistful hope that they may prove mildly amusing to others. Mr. Vidal's interesting hope of a low-priced airplane easily may become a reality with the able assistance of half a million dollars from our government. Naturally I wish Mr. Vidal all success in his earnest and worth-while endeavor, and ask forgiveness for taking the liberty of distilling a little merriment from his widely-publicized experiment.

● Alice was beginning to get very tired of sitting by the window sipping a rye highball. The rye, she thought, wasn't what it used to be before repeal; somehow, it lacked authority. She was considering dully, whether to call up one of the boys or to go out and get a permanent, when suddenly a White Rabbit appeared beside her and began stroking his whiskers.

There was nothing so *very* remarkable in that, thought Alice, for having recently recovered from an attack of jitters, Alice was expecting almost anything; but when the Rabbit *took a picture of Hiram Bingham from his pocket* and began to fan himself with it, Alice started to her feet, for it occurred to her that she had never before seen any one, even a Rabbit, carrying a picture of Hiram. Right there, Alice knew that there was something wrong with her or the Rabbit, who suddenly scurried across the room and popped down the dumb-waiter. Quick as a flash, Alice dropped down after him.

Either the dumb-waiter was very deep, or Alice was very dumb, for as she flashed past the floors she noticed signs reading Newark, Philadelphia, Wilmington, Baltimore, and then Washington, where she lit, although she'd been slightly lit before. It was dark overhead, but before her was a long lighted passage, and the White Rabbit was still in sight, fanning himself with Hi Bingham's picture. Alice was so close behind him that she almost knocked him over when he paused at a door marked "U. S. Dept. of Commerce, Aeronautics Branch, Democratic Idea Department. *Run, Don't Walk.*" The Rabbit broke into a gallop and Alice galloped along after him until they were stopped by a sign reading, "Speak only in whispers—the Duchess is thinking out a New Idea (?)"

"Why the question mark?" asked Alice.

"It's never a *new* idea, really," said the White Rabbit confidentially. "The Duchess only *thinks* it is. Makes it very difficult for us, you know, keeping track. But it all blows over eventually."

He sighed and then opened a door marked, THE HEAD CHEESE, and waved Alice in. The door led into a kitchen which was full of smoke from end to end. Dimly, Alice could see the White Rabbit ahead of her; he was bowing to a very important looking Personage, whom Alice suspected must be the Duchess, the Head Cheese of the Department. This Personage was sitting on a stool holding a baby which she was bouncing up and down at a great rate. Beside a stove stood a tall thin cook with the word "Shorty" embroidered on the back of his coat. He was stirring a pot of soup, and sneezing and humming to himself, "The airlines fly from here to there; and then they fly from there to here. They do it time and time again, but still Glenn Martin goes by train." He looked up suddenly, saw Alice, and shouted: "Shut the door. I'm catching cold; so is the Duchess." He glanced at the Duchess, who was sneezing on the baby, which was sneezing and howling alternately without a moment's pause. Alice found herself sneezing, too, and wondered if it was because the cook kept on shaking pepper into the soup. The only creature in the room that did *not* sneeze was a large cat which was lying on the hearth grinning from ear to ear.

"There's too much pepper flying around," said Alice. "That's why we're all sneezing."

"That's not pepper; it's publicity," said the cook. "Don't you like it?"

"Not much," said Alice, a little timidly. "Would you mind telling me why your cat grins like that."

"It's a Republican Cheshire-cat," said the Duchess, "that's why. I call it Clarence. Pig!"

The Duchess said the last word with such violence that Alice jumped; but she saw in another moment that the epithet was addressed to the baby, not to her, so she said, "Why are you so harsh with that baby?"

"It's an Infant Aircraft Manufacturer," said the Duchess vindictively. "If we had birth control this never would have happened. Drat you!" She shook the baby angrily, and sneezed on it. "Despite all I do," she continued, "the wretched creature *will* grow up to build airplanes for what they cost, instead of for what they should sell for."

"And what *should* they sell for?" asked Alice, who knew nothing about it but who wanted to be polite.

"Seven hundred dollars!" bellowed the Duchess, hitting the baby a resounding smack, upon which it howled louder than ever. "You can build an airplane for the Proletariat for $700; or *somebody* can. Why isn't it done? Tell me *that?*" She glared savagely at Alice.

"I'm sure *I* don't know," replied that young lady nervously, "unless it's just that the damn thing costs more than $700 to build."

"Possibly that's it," growled the Duchess. "But why *should* it? If I happen to think that an airplane should cost only $700, why *shouldn't* it? Under a Democratic Administration we plow under anything we don't like. If a farmer raises more than he can sell, we plow it under;

if an airplane costs over $700 we'll plow under all costs over $700. That solves it, doesn't it?" The Duchess paused suddenly and gazed sternly at the White Rabbit, who was bowing and fanning himself with Hi Bingham's chromo. "Who are *you?*"

"I am the Press," said the White Rabbit. "I deal in information and misinformation on marriages, airplane crashes, politics and similar crimes."

"Then tell your readers I've sent out a questionnaire about a $700 no-purpose airplane," roared the Duchess.

"Is that a fact!" exclaimed the Rabbit.

"We're not concerned with facts here," yelled the Duchess. "We work on a system of wish fulfillment. Everything going out and just half of that coming in is our policy. By 1936 we'll owe 36 billion dollars—if we can find anyone to owe it to."

The White Rabbit nervously fumbled at his whiskers and bowed himself out, writing furiously on a little pad.

"I have another great idea," remarked the Duchess, "saving lights on the airways. Every now and then we'll turn half of them off, and any pilots who are up will have to resort to prayer. This will be a decided religious gain. And it will help the undertakers. Oh, I get ideas like that *all* the time."

Humming and sneezing in somewhat better humor now, the Duchess playfully cuffed the Infant Aircraft Manufacturer over the ear and crooned, "Speak roughly to your little boy and beat him when he sneezes: he only does it to annoy, because he knows it teases. Tell *me* it costs money to build an airplane, will you? You could build an airplane for $700 if you *wanted* to," she growled. "It's just your damned stubbornness—and the price of materials and labor."

The Duchess tossed the baby into a corner and said: "It's time for me to think of a new publicity idea. Pardon me while I give the matter a moment's thought."

"She'll probably give us another grand idea," whispered the Cook. "I wouldn't be surprised if she soon had airplanes down to 70 dollars."

"Why $700?" asked Alice. "Why not $800 or $600?"

"It *has* to be seven," said the Cook sharply. "Seven is a lucky number—that's why she hit upon it. It could have been 7,000 or 700 or 7 or even .7—anything, so long as it was a 7. I happen to fancy eleven, myself," he continued thoughtfully. "I think it's more lucky. I'd have said, "$1,100 or $11 or $11,000. Or 11 cents. So long as it was 11."

Alice began to feel very confused, as every one must in Washington, so she asked timidly, "I wonder if I might take a peek at this $700 airplane."

"Well, you can't exactly *see* it," said the Cook. "But go right through that door there, marked CART BEFORE THE HORSE DEPARTMENT. Be careful of flying fragments and ideas."

As Alice opened the door and entered another room a shadow flashed before her, and she noticed with surprise that it was the Republican Cheshire-cat which she had seen grinning in the kitchen. "Why are you grinning like that?" asked Alice. "Don't you know?" asked the cat, grinning more wickedly than ever. "Well, I'm all that is left of the old Republican Party. I'm a Ragged Individualist. But I'm having a quiet smile to myself, while the Democrats pass everything out and I wonder who's going to pay for it all. It's a great trick like repealing the law of gravity." The cat grinned broadly and vanished. In a second it was back again. "*You're* not a taxpayer, are you?" asked the Cheshire-cat. And when Alice shook her head, "You're lucky," said the cat and vanished again.

Alice walked on into the C. B. T. H. DEPARTMENT. It was a large vague sort of room in which there was nothing but a table, set for tea, and some chairs. Sitting around the table was a rabbit, a dormouse, and a weird human with a very large hat tipped back on his head.

"I'm the March Hare," said the rabbit. "Of course, you've heard the saying, 'As mad as a March Hare.' Well, I'm the fellow they're as mad as." "And I am the Dormouse," said that creature. "I don't amount to any more than a mere Inspector in the Field." At this, the thin chap in the hat laughed happily and said, "I need hardly introduce myself as the Mad Hatter." He smiled gaily. "We're in charge of the CART BEFORE THE HORSE DEPARTMENT," said all three in unison. "We do the *inventing!*"

"What do you invent?" asked Alice.

"$700 airplanes," replied the merry trio. "Do you want one?"

"I'm not sure," said Alice; "I'd like to see it first!"

"Well," explained the March Hare, helping himself to a bun, "we haven't got it *designed* yet."

"But we're working on it," explained the Dormouse, pouring himself a cup of tea. "We'll build it first, and design it afterwards, like Tony Fokker does!"

"Absolutely," confirmed the Mad Hatter. "The Duchess says it will come, and of *course* it will."

"Would you like some wine?" said the Dormouse to Alice.

"I don't see any wine," said Alice, looking around the table.

"There *isn't* any," said the Dormouse. "I merely asked if you would *like* some."

"Of course I would," said Alice.

"Then that's that," said the Dormouse triumphantly. "You'd like some, and there isn't any. You might like an airplane for $700, but there isn't any. See the point?"

"But aren't you inventing it?" asked Alice.

The Mad Hatter winked significantly and chuckled. "Of *course* we are," he said. "We're making it out of a special alloy."

"You always mention that you're doing it with a special alloy. It sounds mysterious," said the March Hare.

"What we're actually using," said the Mad Hatter, "is Vitamin A—we're making the wings of *that*. But come, perhaps you'd like to see what we've done so far." He jumped up, took a bite out of his teacup, and then, followed by Alice, the Dormouse, and the March Hare went skipping off down a corridor and into a room filled with cans, parts of umbrellas, typewriters, automobile engines, fenders and what-not, mostly what-not.

"The idea is to build a cheap airplane for the Masses," remarked the Mad Hatter, "so it doesn't matter much what goes into it, as the Masses are practically inexhaustible—one down, and another goes up. Now here—" he picked up a tin can "here we have a cylinder. We'd have had a $700 airplane years ago if only someone had thought of using these cans as engine cylinders. You can get them in any grocery, quietly eat the soup, and there's your cylinder, all ready for final assembly." The Mad Hatter smiled triumphantly, picked up an old umbrella and, indicating the ribs, remarked briefly that here were the ribs for the wings, already cambered.

"It has been a hard winter," remarked the March Hare suddenly. "And in a hard winter, plumbing freezes up all over the country, resulting in burst pipes. Well, the government is buying up all the burst pipes, and that's what we make the fuselage of. We shot weld the cracks, and there we are!"

"*Where* are we?" asked the Dormouse.

"You're not supposed to ask that," said the March Hare severely. "With a 36 billion dollar National Debt, what's the use of asking where we are? *Nobody* knows. You pray, and have confidence—the publicity department supplies the confidence. Would you like a flight?"

"Well, I don't know—" Alice said doubtfully.

"Neither do we," smiled the Mad Hatter, "but let's sit in this experimental job and pretend we're going somewhere in it." He pointed to a remarkable looking creation somewhat resembling an airplane. The wings and fuselage were covered with cheese cloth through which ends of pipes stuck here and there. The engine, made of soup cans stuck around the sides of a dish pan, gave out a clanking noise when the Mad Hatter turned the propeller, which at one time evidently was an electric fan. "Get in," he said, "and fix your mind on better days ahead. Now then, just *wish*, wish *hard!*"

(*Continued on page* 71)

• EDITORIALS •

"We need about 660 new airplanes to meet the requirements of the new ships sought under the Vinson bill. These would be in addition to the 1,000 airplanes, for which the building program has already been completed."—ADMIRAL WILLIAM H. STANDLEY.

Coordination in Air Express

• Various aeronautical concerns have been consolidated to their mutual advantage, and a similar advantage might accrue to airline operators if they establish their express activities under a single agency.

It would seem that such an agency would best function if controlled by the airlines themselves, rather than by an alien organization. The benefits that shippers of air express would derive might well be a foundation upon which a greater and more profitable business might be built.

An added impetus will be given to the air express portion of our transport business by the devisement of uniform way bills and tariffs and by coordinated schedules by the airlines, features which are not existing under present arrangements.

In this air express agency, prime consideration should be given to the shipper's convenience and to methods which would assure his goods the fastest and most expeditious service at the lowest possible rates. In order to be efficient it is not enough that useless competition in air express be eliminated. Provision must be made to furnish service surpassing other methods of shipping and from which, by catering intelligently to the shipper, an even greater airline income, in express, mail and passengers, will result.

Aviation Courses for Public Schools

• Thousands of young students, boys and girls, would quickly take advantage of any opportunity of learning about aerodynamics, navigation and meteorology. Serious consideration should be given the problem of teaching them the fundamentals of aviation. It is in these youngsters that rests the future of not only the aviation industry, but also of the country as well, for they are the generation in which our hopes for a greater aviation are placed.

We believe that aerodynamics, or aviation, should be added to the science curricula in the public schools of every state, giving all students the opportunity of choosing this course in lieu of (or together with) those in chemistry, physics, botany or other sciences now being taught in our secondary schools. This will provide our youngsters with an opportunity to study the fundamentals of aviation and provide them with a background which will reflect favorably in later years when they are able to purchase their own aircraft or when they will be called upon to decide which profession they would like to choose for their life work.

The addition of aviation to the curricula of our public schools will not handicap our flying and ground schools as it might at first appear. On the contrary, it should be a great stimulus to existing schools. The student in the secondary school is not the flying student of today. He may be, though, by the time he is graduated. With a better knowledge of the science of aviation he will be in a position to know whether or not he wants to continue the study of aeronautics. It is then that our flying and ground schools and schools of aeronautics in universities will benefit by what was accomplished in the secondary school.

Our Need for Protection

• Political unrest in every part of the world makes it more necessary than ever before that the United States should be equipped with adequate aerial defenses, both equipment and personnel. This truth has had but brief thought by many who are in a position to endorse proper measures to insure our place in the sky, but who have been lulled to inactivity by the insidious propaganda of fanatical pacifists.

Chairman McSwain of the House Military Affairs Committee recently declared that the airplane is bound to be the most powerful, if not the decisive factor in the next major war of the future, to which we look forward with trepidation. He believes that it is impossible for any treaty to control these engines of destruction. The views expressed by Chairman McSwain are most logical, ably following in the footsteps of Congressman W. Frank James, formerly head of the Military Affairs Committee, and recognized as one of the most brilliant leaders on the subject, and particularly in matters pertaining to aeronautics.

As a protector of the Western Hemisphere (which really amounts to self-protection) we are in need of greater aerial strength. Our peculiar geographic and political situations place the burden of protection upon us.

Nations beset with internal strife and dissatisfaction and financially burdened almost beyond belief are finding ways of building up their air forces as a first requisite of preparedness; whether for aggression or protection, remains to be seen.

This country cannot afford not to have aerial protection second to none. We will not be respected by other nations unless we are in a position to demand respect. Representative James M. Beck of Pennsylvania, claims we are the one nation which somehow has gotten on the nerves of the world, and the nerves of the world are of a neurasthenic and are dangerous to irritate. Irritation by us is less apt to be translated into aggressive action from nations of lesser strength, and the surest way for us to avoid conflict is to have such visible strength that any war-seeking nations will hesitate to challenge our rights.

Being a youthful nation we are apt to err in world diplomacy. We are no match for the wily statesmen of the old world whose intrigues and plots honeycomb the world. Our lack in this regard can be compensated for only in a first-rate system of protection, with aircraft forming our most dependable and surest safeguard.

Postmaster General Brown

(*Continued from page 17*)

methods and fair dealing. . . ."

January 1933—". . . Brown's plans for the curtailment of the Air Mail service because a raise of rates does not increase its business, are characteristic. If he had tried the thought which we without charge offered him some time ago of making the Air Mail rate two cents (not three), every plane would have been traveling full of mail from the morning of the low rate's first day, and earning a profit for the operators, for the Government and for the users of Air Mail as never has been earned before by any postal service.

"Brown may be a wondrous politician, although his activities in Ohio during the last campaign did not prove it, but in our opinion he should have been given a four year course of instruction before being permitted to assume the duties of the Postmaster Generalship, which would have left him now on the threshold of entirely new activities, and with no trail of misapplied ideas in the Post Office behind him. . . ."

"Air Cruisers" as the Ultimate Military Aircraft

Major General JAMES E. FECHET, U. S. Army (Ret.)

● One of the Army's leading authorities on pursuit aviation recently discussed with me the article, "Pursuit versus Bombardment," which I wrote for the August issue of AERO DIGEST. This pursuit man, one of the best during my tour as Chief of the Air Corps, correctly deducted the fact that my article had been influenced by the writings of General Douhet of the Italian Army. I am giving you his "come back" in his own words.

General Douhet's Air Force would consist of one type of airplane only, the "air cruiser," which would have the following general characteristics: Large, comparatively slow, heavy weight carrying, equipped with strong defense armament, and capable of substituting bomb load for fuel load and vice versa. General Douhet proposes to win wars by hurling a mass of such air cruisers against the morale of his adversary.

Assuming two nations at war equipped with air cruisers only, the picture is comparable to that of two Primo Carneras in the ring, standing just far enough apart so that their blows fall short of the mark. To complete the picture let their bodies represent the opposing Air Forces and the air in which their blows land that intangible thing called morale, so intangible as a matter of fact that national defense should not be based on it alone. Frequently he fights hardest whose feelings are hurt most. No direct blows are delivered either in the case of the Air Force or the pugilist.

Upon declaration of war both Air Forces are dispatched. On the way to their respective objectives they sight each other. Neither force can prevent the attack of the other. Both have ground installations as their objectives, munitions factories, airdromes, etc. Presumably the airdromes are empty of air cruisers, so it is futile to bombard them even if they can be found.

A nation to have air mastery and, therefore, the ability to gain a decision by the use of an Air Force, must be able to operate its own Air Force with freedom, denying, at the same time, that freedom to its adversary. In the above situation air mastery is erased from the picture. Both nations have freedom of the air and the decision as far as the Air Forces are concerned then depends on their respective morales, or will necessitate ground armies coming in contact. So we see that morale is too nebulous to form a basis of national defense.

Let us assume that the mutual bombardment continues until all the airplanes are worn out through "fair wear and tear" in service; all ground installation of both contestants have been put out of commission by the bombardment. Then what happens? The ground armies come in contact and the contest is decided on the ground, "without benefit of sky pilots" if you will. Such a situation is a far cry from General Douhet's "Utopia of the Air."

An Italian "Air Cruiser" of 1930, the 6000-horsepower Caproni model 90 P.B.

For purposes of contrast we will assume two nations, *A* and *B*, at war. Both possess the same natural resources and monetary air budgets. *A* decided to expend its budget by building 2,000 air cruisers, while *B*'s policy demanded 1,000 bombardment planes (or air cruisers) and 3,000 fighters or pursuit—three of which could be built for the price of one air cruiser. Both nations included sufficient Air Force observation in their budgets to cover their needs.

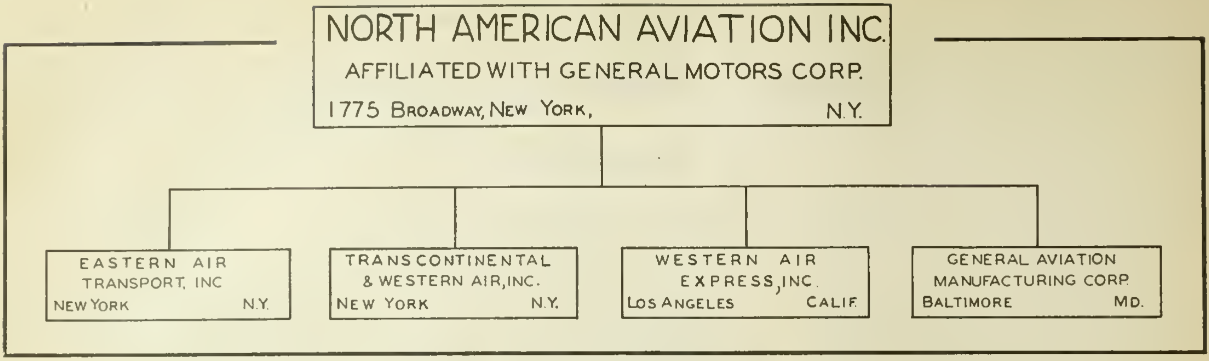
B has found through experience that radio communication and intelligence nets for the detection of the approach of enemy aircraft have both developed to the point where the interception of the invading Air Force is no longer guess work, but has been reasonably assured. Summing up the advantages and disadvantages of these two Air Forces, we find that *A* has a powerful striking force which, if capable of reaching its objective, can deliver a correspondingly powerful blow. It cannot, however, strike *B*'s Air Force except on the ground, where it would be widely dispersed and, therefore, an exceedingly difficult target.

A has no weapons to prevent *B*'s air cruisers from making an uninterrupted attack.

On the other hand, *B* has a powerful striking force. Its air cruisers, although only half in number, can carry much more than half the bomb load due to the fact that it is not necessary to carry defensive armament. *B* has a weapon, in its fighters, operating over an intelligence net to prevent *A*'s attack. In other words, *B* has freedom of the air and the means at hand to deny that freedom to *A*—air mastery, the decision.

The principles involved in the organization of *B*'s Air Force are identical with those of ground armies, although it will be operating long before the ground forces come in contact. The defense is an inherent part of the offense. It matters not whether a ground force be executing an enveloping, penetrating or turning movement, a part of that force is in effect defending, leaving the remainder of the force free to execute the movement.

(*Continued on page* 49)


NORTH AMERICAN AVIATION INC.
AFFILIATED WITH GENERAL MOTORS CORP.
1775 BROADWAY, NEW YORK, N.Y.
EASTERN AIR TRANSPORT, INC
NEW YORK N.Y.
TRANSCONTINENTAL & WESTERN AIR, INC.
NEW YORK N.Y.
WESTERN AIR EXPRESS, INC.
LOS ANGELES CALIF.
GENERAL AVIATION MANUFACTURING CORP.
BALTIMORE MD.

North American Aviation, Inc.

ITS HISTORICAL DEVELOPMENT, SCOPE OF ACTIVITIES AND EXECUTIVE PERSONNEL

THE THIRD OF A SERIES OF FEATURE ARTICLES RELATING TO THE MAJOR AERONAUTICAL ORGANIZATIONS OF THE UNITED STATES

● Whatever factors were responsible for placing General Motors Corporation in its present enviable position in the automotive world, are probably also responsible for prompting its expansion beyond its preconceived activities to bring under its guidance some of the outstanding aeronautical organizations.

It was not with the idea of being the first automotive manufacturer to become interested in aviation which led to the deal which, early last year, brought General Motors control of North American Aviation, Inc., for GM had been interested in aeronautics and its development since 1929 when it purchased a large interest in the Fokker Aircraft Corporation of America. Nor was it with the intention of utilizing the airlines to beat competition in the automotive market, for General Motors' position among the leaders of that industry has long been unchallenged. It was, more than anything else, an attestation of a definite and determined effort on its part consistently to keep abreast of new developments in transportation—evidence of the same determination and aggressiveness that brought it so prominently to the front in the automotive field and which now promises to carry it to comparable heights in the aeronautical field.

In advising his stockholders of the corporation's growing interest in the aviation industry, Alfred P. Sloan, Jr., president of General Motors, reflected this policy and touched the key-note when he said:

"As it is becoming more and more apparent that the airplane is destined to play an increasingly important part in the field of motor transportation, our interests in the aviation industry have ecently been expanded.

"The success of air transportation fundamentally depends upon motive power as does every other means of transportation. Naturally, General Motors is constantly on the alert to expand its interest in this motive power and broaden its effort in the direction where additional opportunities are offered."

As producers of military aircraft, GM is in a position to profit by the sums being expended experimentally for the development and improvement of aircraft and engines by the Government through the Army and Navy which, in turn, can be utilized advantageously by the air transport industry and be in sympathy with the automotive industry, and by the same token permit the research and engineering facilities of General Motors to create, develop and serve.

Mr. Sloan further enlightened his stockholders by his information that "Construction of airplanes for use in commercial air transport operations must be based primarily upon furnishing the operators with airplanes which can be operated at sufficiently low cost to permit the operator to make a reasonable profit. At the same time, the requirements of the individual operator must be reconciled with the limitations imposed upon the manufacturer with respect to the design and production of airplanes. A closer association of the operator and the manufacturer should bring about this desirable cooperation and should result in a more constructive development of the aircraft industry. The manufacturer who can combine in the design of his planes the experience of the operator and that of the manufacturer should be in a position to offer desirable equipment to all transport operators."

As a start in the right direction, General Motors has become affiliated with a pioneer in the business—*North American Aviation, Inc.*, formed on December 6,

Harris M. Hanshue

Richard W. Robbins

Ernest R. Breech

Thomas B. Doe

Temple N. Joyce

1928, as an investment trust. Subsequent developments, however, necessitated a change in its corporate structure and it became instead a holding and management organization under the leadership of C. M. Keys, who, as president, was associated with Captain Thomas B. Doe and J. Cheever Cowdin, vice-presidents and J. A. B. Smith, secretary-treasurer.

North American Aviation lost little time in getting down to business. On January 14, 1929, it acquired outright the Sperry Gyroscope Company, Inc., and in June of the same year purchased Pitcairn Aviation, Inc., from Harold F. Pitcairn. At that time, Pitcairn was operating, under contract, CAM 19 and CAM 25, two important air mail lines which were serving the Atlantic seaboard between New York, Atlanta, Miami and intermediate points, but shortly thereafter the management company inaugurated air passenger services over the route and changed the company's name to Eastern Air Transport. Subsequently came the acquisition of the Ford Instrument Company, Inc., which since 1915 has specialized in the manufacture of naval gunfire control devices. Another purchase brought it the assets of Berliner-Joyce Aircraft Corporation, which since 1929 was manufacturing aircraft for the military services of the United States.

At that time, North American Aviation was a large stockholder in the Curtiss-Wright Corporation and in Intercontinent Aviation, Inc. The latter founded Cia Nacional Cubana de Aviacion Curtiss, S. A., an airline company operating between Havana, Santiago and intermediate points as the first air mail and passenger line in Cuba. Intercontinent Aviation, Inc., also owned the controlling interest in Cia Aviacion Faucett, S. A., a mail, passenger and express air service operating in Peru. In a wider extension of its activities, Intercontinent Aviation, Inc., held China Airways Federal, Inc., a company whose ships flew between various points in China including Shanghai, Nanking and Hangkow.

Further expansion in the organization came in 1931, when Eastern Air Transport purchased New York Airways, Inc., flying between New York and Atlantic City, and early in 1933 when it took over the operating assets of the Ludington Line and brought its operations under the banner of North American Aviation, Inc.

As a result of the purchases of stock and the formation of new holding companies, the position of General Motors and North American Aviation, Inc., in the early part of 1933, was most propitious for a consolidation. General Aviation Corporation, through its subsidiary General Aviation Manufacturing Corporation, had taken over the manufacturing activities of the Fokker Aircraft Corporation of America, and through various stock acquisitions held a substantial block of stock of Western Air Express. The latter, meanwhile, owned a 47½ per cent interest in Transcontinental & Western Air, Inc.

North American Aviation, Inc., owned Eastern Air Transport, Inc., outright and held a substantial block of T. A. T., the latter also owning a 47½ per cent interest in Transcontinental & Western Air, Inc. B/J Aircraft Corporation (the former Berliner-Joyce Aircraft Co.) was also wholly owned by North American Aviation.

It was then decided to form The Sperry Corporation so that all of North American Aviation's investments in the Sperry Gyroscope Company, Ford Instrument Company, Intercontinent Aviation, Inc., Curtiss-Wright Corporation and certain other assets would be acquired by it in exchange for all of The Sperry Corporation's capital stock. This stock was then turned over to the voting trustees of The Sperry Corporation, who, in turn, issued voting trust certificates which were distributed to North American Aviation stockholders of record as of April 27, 1933, on a share-for-share basis.

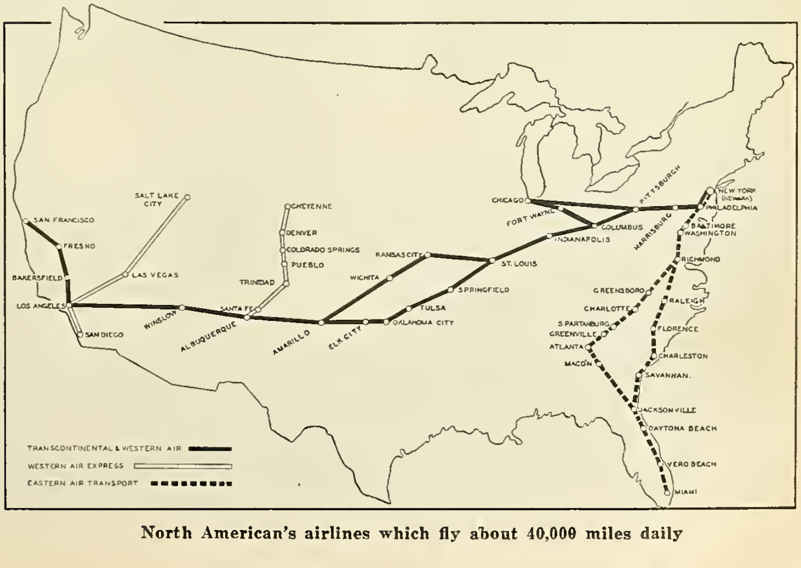
North American Aviation then took over substantially all the assets of General Aviation Corporation. Ernest R. Breech was elected chairman of its board and president. Captain Thomas B. Doe and Richard W. Robbins were elected vice-presidents and the company assumed its present form.

An outline of General Motors aviation interests discloses the extent of its wide and diversified holdings. Taking the transport phase first, North American Aviation, Inc., as the parent company, controls either directly or indirectly, Eastern Air Transport, Transcontinental & Western Air and Western Air Express. Each of these airlines has pioneered the services through its own territory, and, together, they provide a transcontinental service, an Eastern Seaboard service and a service from the Central West to the Southwest and West Coast. Their position of prominence in the industry is reflected in their consolidated operations and traffic report for the first eleven months of 1933 when they recorded 26 per cent of all the scheduled miles flown in the country, averaging approximately 40,000 miles each day. The group's activities represented 28 per cent of all the passenger miles flown and 27 per cent of all the air express carried. Twenty-five per cent of all the passengers carried during this period flew over North American Aviation routes, representative of a 72 per cent increase over the preceding year.

In the engineering and manufacturing field, North American controls General Aviation Manufacturing Corporation (with which B/J Aircraft Corp. has been merged) of Dundalk, Maryland, and has a substantial interest in Douglas Aircraft Company, Inc., at Santa Monica, California. These companies produce a varied line of aircraft ranging from small, fast military pursuit planes to large and luxurious airliners.

Mr. Breech, youthful and enthusiastic president, gives a true reflection of General Motors' attitude toward its newest acquisition when he says:

"What has happened many years ago in the automobile industry is now happening in the aviation world. Various concerns of minor and major importance have been brought together to their mutual advantage, so that in the United States today there are three great air transport groups, of which the North American Aviation group holds second



North American's airlines which fly about 40,000 miles daily

Eastern Air uses Curtiss Condors to fly the greatest part of its 10,064 miles scheduled each day

place for mail and passengers carried and for passenger miles flown, and first place for air express transported.

"North American Aviation, Inc., is striving to build a self-contained, economically sound organization, backed by the strong support of General Motors. It seeks to provide in the air what other General Motors affiliates and units have for many years provided on the ground—to serve faithfully the best interests of all.

"Fortunately for the science of aeronautics, the industry and national defense, firms with proven records for good management, and with strong financial support and national prestige have become interested. This in itself is indicative of the high place and esteem that this science holds in the minds of America's most patriotic citizens, for never before in the history of aviation has its value been so fully realized as a national resource."

It is further pointed out by Mr. Breech, that in spite of the advances made, the airline operators are faced with the unalterable fact that no airplane built to date can maintain itself financially upon the revenue from passengers alone.

Aircraft engineers, he feels, should keep this fundamental shortcoming of airplanes constantly in mind, for the aviation industry can never attain its majority until the answer to this economic problem has been found.

What the air transport industry in the United States needs at this time, he thinks, is a stabilized future. The changes in aviation policy, the uncertainty of air mail appropriations, and the uncertainty of air mail rates have made it impossible for the airline operators to plan on orderly progress. This country needs a five-year air mail program based on sound economics. The air mail service can be made not only self-supporting, but profitable Government business, if Congress will only provide the necessary basic legislation.

Our airways and the airlines which spread their network over the country are today far ahead of Europe. He believes it is only with a sound five-year program that we can hope to maintain world leadership in commercial aviation. On the other hand, if short-sighted national policy permits the airlines to retrogress, we shall fall so far behind that not only our economic recovery will be retarded by the loss of a speedy, flexible means of transportation, but our national security will also be jeopardized.

In spite of the economical trend of the times, a number of cities have taken advantage of conditions to give emergency employment by improving municipal airports. If the country is to reap the full benefits of air travel, he believes municipalities must continue to maintain their airports and improve them to match new developments in the air transportation field.

He is of the opinion that more real progress has been made in passenger air transport during 1933 as a result of new and refined equipment than has been realized during the preceding three years. The value of air travel to the public has been enhanced many fold by the saving of time, due to transports cruising 170 miles an hour, and the realization of comfort through improved seating arrangements and the reduction of noise. Now is the opportune time to make air mail, air express, and air passenger transportation a national custom. The Congress which is now in session can lay the ground work. The industry, he is sure, "will do its part."

●

EASTERN AIR TRANSPORT

It is the night of May 1, 1928. Two planes are wheeled from their hangar at Hadley Field and loaded down with bag after bag of inaugural air mail letters. Two pilots sit in the cockpit of their ships, anxiously waiting for the signal that will send them on their way. At 9:40 they are off into the sky, heading due south for Atlanta, Ga., 763 miles away. Three other ships, also loaded with cargoes of mail, are already in the air, flying a compass course that will take them from Atlanta to New Brunswick, N. J.

Thus, months of study, investigation and development were culminated. More than a year before the government had awarded the contract for CAM 19 to Pitcairn Aviation, Inc., and, while waiting for the completion of a lighted airway, it engineered the Pitcairn PA-5 Mailwing, especially designed for the service it would be called upon to render. On that memorable night almost six years ago, eight of these ships were ready, and larger types were being turned out in a Pennsylvania factory.

Following this somewhat auspicious beginning, the company expanded and flew to Philadelphia on an extension line connecting with the transcontinental airway, and on December 1, 1928, initiated service over CAM 25 between Atlanta and Miami, thus serving the entire Atlantic Seaboard from New York to Miami.

March 1, 1929, saw inauguration of Florida cross-state service between Daytona Beach and Tampa, bringing the company's scheduled daily mileage to 2,998. The increasing mail poundage soon demanded a change in schedule and on May 5, the line offered daily service instead of "daily except Sunday." Meanwhile Harold F. Pitcairn, president, had organized the Pitcairn-Cierva Autogiro Company of America and, deciding to concentrate on the development of autogiros, transferred ownership of the airline to North American Aviation. Offices were moved from Philadelphia to the Sperry Building, Brooklyn, N. Y., and construction began on a new passenger terminal-repair shop building at Candler Field, Atlanta. Before this eventful year closed direct service was started to St. Petersburg, Florida, and the installation of radio range beacons along the New York-Atlanta airway neared completion.

After changing the company's name on January 15, 1930, to Eastern Air

Transport, Capt. Thomas B. Doe was elected president; Mr. Keys chairman of the board. The northern terminal was then transferred to Newark airport, and coincident with the opening of the Candler Field depot, operations personnel were transferred there from Richmond.

On April 1, a permanent double schedule began between New York and Atlanta; service through Florida went on a night schedule and Charlotte, N. C., was included on the route. Daily scheduled mileage was increased to 5,120 and six planes daily served Washington, Philadelphia and New York. Four planes flew between New York and Atlanta.

Passenger service was inaugurated August 18 between New York, Philadelphia, Baltimore, Washington and Richmond on a daily except Sunday basis. Greenville, S. C., was next embraced as a stop and passenger service was extended to Atlanta. With this new service, started December 10, the twin-engined, 18-passenger Curtiss Condors went into operation between Washington and New York while the six-passenger Curtiss Kingbirds flew between Washington and Atlanta.

Extensions of passenger service were made January 1, 1931, between Atlanta and Miami and Daytona Beach and St. Petersburg, that month also witnessing the introduction of "flying hostesses" on all Condors. On April 1, coastal passenger and mail service from Richmond to Raleigh, Florence, Charleston, Savannah and Jacksonville opened over a 581-mile route as Condor service was extended southward to Richmond. July was outstanding because of the number of new routes opened—on the 10th, between New York and Atlantic City; on the 15th between Camden and Atlantic City and on the 20th between Washington, Baltimore and Atlantic City (seasonal only).

Beginning October 1, the Condors were placed in service to Atlanta and Jacksonville. A rate reduction on one-way trips and special round-trip tariffs went into effect as the company commenced a new Norfolk passenger service from all cities by way of Richmond and announced express sections on special trips between New York and Washington. The installation and test was made of a Sperry automatic pilot in a Condor and plans were formulated by Eastern Air to continue experimenting with it.

Another passenger service was started on December 1, this one between Atlanta and Savannah where it joined the company's two trunk lines and formed an important link between its service and that of American Airways. At the close of the year more than 32,000 passengers had flown with the company.

Night air mail was inaugurated over two routes along the Eastern Seaboard from North to Latin America on June 1, 1932, and four cities on the EAT system for the first time also received this type of service. They were Raleigh, Charleston, Florence and Savannah. Shortly after, six major airlines in the United States (one of them EAT) agreed on arrangements which permitted air express to operate on an interline basis. By this agreement, Eastern Air was able to serve the municipalities along its routes with express connections to 130 cities through the new operating agency known as General Air Express. A new line between Charlotte, N. C., Camden and Columbia, S. C., and Augusta, Ga., added 172 miles to the company's routes, but during the year greater attention was given to consolidation of activities and strengthening of operations rather than expansion. Passenger volume during 1932 showed a substantial increase, but the higher air mail rate was partly responsible for a 100,000-pound drop in poundage over the preceding year.

Effective January 7, 1933, through service was instituted between New York and Miami, allowing passengers to travel the entire length of the East Coast in one day. By the elimination of the overnight stop at Jacksonville and a revision of schedules, a 13-hour service was offered by the company.

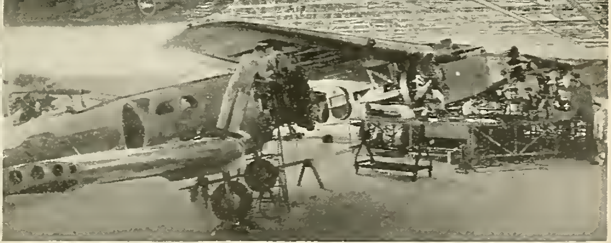
On February 15, Eastern Air acquired the operating assets of Ludington Airlines, Inc., which company then retired from the air transport business.

Under the terms of a merger between North American Aviation, Inc., and General Aviation Corp., General Motors Corporation assumed control of various aviation properties, including EAT. At the present time, Ernest R. Breech is chairman of the Board of Directors of Eastern Air Transport, Inc.; Captain Thomas B. Doe is president and general manager; Harold A. Elliott, vice-president in charge of operations, and L. Edwin Gill vice-president in charge of traffic. The company's executive headquarters are now in the General Motors Building in New York City and the operations headquarters in Atlanta.

A most intensive use of large airliners began July 1, 1933 between New York and Washington when 10 round-trips daily, five of them high-speed, non-stop express schedules, went into service. Every trip was flown in new twin-engined Curtiss Condors, heralded as the largest, most luxurious and quietest land planes in America. (This plane was described in detail in the February, 1933, issue of AERO DIGEST.) Other changes went into effect simultaneously. New Condors were placed into daily service over the New York-Atlanta trunkline. At the half-way mark, June, 28,732 passengers flew with the company, giving it its greatest six-month period in its history.

Thus today an interesting comparison is found in the company of 1928 and the Eastern Air Transport of 1934. Instead of six small mail planes and 61 employees, there are 45 large airliners and mail planes and a personnel of over 500. In the place of a daily scheduled mileage of 1,526 over a 763-mile airway there is an average daily scheduled mileage of 10,064 over an airway whose routes total 2,118 miles. Where once ten cities in eight states were embraced for service, now 23 cities in 10 states are served by the company.

One of TWA's fleet of planes—A Lockheed



On the inside of the $300,000 base at Kansas City

TRANSCONTINENTAL & WESTERN AIR

To the executives of Transcontinental Air Transport, the task of operating an exclusive passenger airline was something more than just flying airplanes. Month after month went by after the company was formed and from all outward indications little was being done except making preliminary detailed surveys of conditions along the route to be flown.

Here was a man-sized job—this operation of an air-rail service from the Atlantic to the Pacific. With their $5,000,000 investment, these men were obliged to practice self-restraint to refrain from operating sooner than was safe and practical in order to realize some return on their money. But they, by choice, rather took the alternative and, before allowing a single passenger to leave the ground, assured themselves of a firm foundation, at least, upon which to mould one of the country's largest air passenger units.

Vast preparations were imperative, calling, as they did, for the selection of experienced pilots, the grooming and lighting of airports and provisioning of passenger accommodations, the installation of equipment for radio communications, the training of personnel, the organization of maintenance and repair shops and the preliminary tests of a nation-wide meteorological division.

The broad-visioned directors provided for a technical committee and placed in charge Col. Charles A. Lindbergh, entrusting to him and his group the difficult task of adjusting the mechanical difficulties in the plan and of surveying the route to be flown.

Lindbergh, finished with his preliminary work, placed his O. K. on personnel, equipment and facilities and advised his associates to begin operations. And so, on July 8, 1929, more than 14 months after its incorporation, the company inaugurated service on a 48-hour coast-to-coast schedule.

This initial service was offered in conjunction with the Pennsylvania and Santa Fe railroads. Passengers traveled between New York and Columbus and between Waynoka, Okla., and Clovis, N. Mex., by train at night and by plane during the day between Columbus and Waynoka via Indianapolis, St. Louis, Kansas City and Wichita and between Clovis and Los Angeles by way of Albuquerque, Winslow and Kingman.

Four months later, November 16 *Maddux Air Lines was merged with TAT and the route extended from Los Angeles to San Francisco and intermediate points, bringing about the first through air-rail service from New York to San Francisco. The name of the company was then changed to Transcontinental Air Transport-Maddux Air Lines.

Then under authority of the Watres-McNary Act, CAM 34 was awarded by public bidding to Western Air Express, Inc., and TAT-Maddux, who in turn formed Transcontinental and Western Air, Inc., as an operating subsidiary to carry out the air mail contract. Operations began October 25, 1930, bringing the new company the distinction of being the first operator to provide an all-air mail and passenger service between New York, Los Angeles and intermediate points. The route of the new company followed almost exactly the former routes of TAT and Western Air Express and at the same time retained all of the elastic rail connections of both companies. A 36-hour all-air service was inaugurated and the 48-hour air-rail service continued. In each case the schedules provided for overnight stops in hotels; the all-air schedule halted at Kansas City, the air-rail schedule at Amarillo.

Express helps swell payload receipts

The completion of the lighted airway from coast-to-coast brought a change in schedules early in 1931 when a 24-hour transcontinental service was proffered. The former policy of operating during the day only was altered to provide day and night flying, but passengers not desiring to fly after dark, had the option of remaining overnight in hotels at terminal cities.

A new direct all-air service was inaugurated May 1 between New York and Chicago on an eight-hour schedule with stops at Philadelphia, Harrisburg, Pittsburgh, Columbus and Fort Wayne. Later, two additional round-trips for passengers and express were launched between New York and Pittsburgh, which, in combination with the transcontinental and Chicago services, provided four round-trips daily between New York and Pittsburgh on a schedule of a little more than two hours of flight.

TWA then became one of the companies operating under the interline air express arrangement (General Air Express) and subsequently offered coordinated service through an agreement with the Greyhound Bus Lines for through ticketing of passengers and express.

The company came under the presidency of Richard W. Robbins, elected in July, 1931, and continued to carry out a program of expansion and improvement of services.

The 36-hour coast-to-coast schedule with an overnight stop at Kansas City was still offered early in 1932. In April, a new late afternoon schedule in each direction between New York and Pittsburgh was inaugurated over a 341-mile airway. Schedules were rearranged on the southwestern lines of the company between St. Louis and Amarillo, so that planes connected at each end with the main line operation and provided one-day service from St. Louis to Los Angeles and from Amarillo to New York. Through connections at Tulsa with other airlines, fast through service from New York and principal cities in Texas also was provided.

The fastest air passenger schedules ever operated between the Atlantic and Pacific coasts went into effect in November when overnight passenger service between New York and Kansas City was started. These new schedules cut existing time between New York and Los Angeles over the 2,567-mile route to 24 hours 42 minutes eastbound and 28 hours 43 minutes westbound, elapsed time.

A new and thoroughly modern maintenance base, costing $300,000, was opened in Kansas City during the year. Typical of the trend toward consolidating overhaul and repair work at a central point, or at least at a strategic division station, the structure is 400 by 300 feet, of brick and steel construction. It provides a hangar capable of housing 20 large transport planes, machine shops, engine testing laboratories, metal shops, instrument and radio rooms, a central dispatch room, weather bureau and general offices of the company's various departments.

TWA's operating organization has, of course, undergone a change in the past five years, but these evolutions have always been directed toward perfecting the economy as well as the efficiency of the system as a unit.

The company's airways are divided into two regions, each of which is broken down into divisions. The Eastern Region includes the Atlantic Division, Eastern Division and Southern Division; the Western Region includes the Pacific Division and Mountain Division. Logically, the Operating Headquarters are at Kansas City, known as the Central Operating Base. Here are located the vice-president in charge of operations and the two region superintendents as well as three executives whose individual responsibilities necessarily extend throughout the system—the System Maintenance Superintendent, the Chief Meteorologist and the Communications Engineer.

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*Maddux Air Lines operated a scheduled service for passengers between Los Angeles and San Diego, Los Angeles and San Francisco to cities in both the Imperial and San Joaquin Valleys, and from Los Angeles-Tia Juana and Agua Caliente before it merged with Transcontinental Air Transport. It started to operate July 21, 1927, and in 1929 flew more than a million miles.

Like the Operating Department, the Traffic Department is similarly divided into two regions. The Eastern Region Traffic Manager is located in Pittsburgh while the Western Region Traffic Manager has his office in Los Angeles, both reporting to the General Traffic Manager in New York.

Headed by E. R. Breech, Chairman of the Board, and Richard W. Robbins as president, other officers of Transcontinental and Western Air, Inc., are Jack Frye, vice-president in charge of operations; J. L. Maddux, vice-president; Col. Charles A. Lindbergh, Chairman of the Technical Committee; and J. W. Brennan, General Traffic Manager.

At the present time new equipment is on order and now testing that will result shortly in the establishment of a transcontinental air service in 16 hours eastbound and 18 hours westbound. Among them is the twin-engined Douglas transport, a description of which appeared in the October, 1933, issue of AERO DIGEST. Thus in the short space of five years, the airline will have cut the total elapsed time for a transcontinental journey from 48 hours to 16 hours, representing a faster development and improvement of service on the part of this newest form of transport service than was done in the past by surface transportation.

Cold statistics indicate clearly that America's first transcontinental airline system has indeed made progress and is rapidly expanding along progressive lines. Whereas in 1929 TAT carried only 4,436 passengers, and 41,738 were flown by TWA in 1933, is indicative that passenger, mail and express figures for 1934 will show a greater volume in the combined total than in any preceding year.

Today, under the banner of General Motors Corp., through its subsidiary North American Aviation, Inc., which acquired working control of the company during 1933, TWA operates an average of 23,300 miles daily over a 4,372-mile airway serving 23 cities.

Since the start of TWA operations in October, 1930, more than 125,000 passengers, more than 3,000,000 pounds of mail, and almost 500,000 pounds of express have been carried in the course of flying 17,000,000 miles.

WESTERN AIR EXPRESS

When the pioneers of air transportation are considered, Western Air Express undoubtedly deserves a place far in the van, by virtue of being the first air mail line in the West and because of the revolutionary tactics employed in establishing operating and traffic methods for conducting its business.

In 1920 the Post Office Department extended its air mail service over the transcontinental route to San Francisco, leaving Southern California in a status similar to that of the "forgotten man," its civic pride and to some extent, its purse, hurt. Finally, after the route indicated public acceptance and the Postmaster General had the authority to contract with individuals to carry the mail by air, Los Angeles was tied into the Chicago-New York route through a 653-mile line over the Great American desert to Salt Lake City. Western Air Express, formed in July, 1925, by businessmen in Los Angeles, was awarded the contract.

Flying over Mint Canyon with WAE

With six reconditioned army-type Douglas biplanes, Harris M. Hanshue, its president, launched the company on its first aerial venture April 17, 1926. It had the contract for CAM 4, extending from Los Angeles to Salt Lake City via Las Vegas, but soon realized that the leading business institutions alone would not provide sufficient volume to pay for the operation of the company. So a systematic campaign to sell the public on the value of speed in communication was inaugurated and followed up through a door-to-door canvas. Poundage increased enormously and shortly after steps were taken to initiate passenger carrying.

Slight changes were made in the Douglas planes and on May 23, 1926, the first flying of passengers on an air mail plane between two designated points on regular schedule was established. Two people were accommodated in each plane and with business brisk, the plan appeared highly feasible and headed toward success.

By August, Mr. Hanshue's sales methods for increasing the air mail poundage succeeded in making the Los Angeles area the greatest user of air mail per capita in the nation. Traffic men were instructed to sound out the public on travel by air along with their air mail sales talks. Reactions to flying were tabulated and these reports convinced Mr. Hanshue that the day of air transportation and air travel was not far away. It was time, he said, for expansion.

Operations seemed headed for new highs at the end of 1926. The percentage of performance was over 99 per cent, the company being ready and able to attempt every one of the 518 scheduled trips. None were defaulted, although there were brief delays at times at the Salt Lake City end due to the late arrival of the transcontinental planes. Only two trips were interrupted during this period because of mechanical trouble and five were held up because of weather. 328,892 miles were flown with 70,230 pounds of mail and 258 passengers.

The acquisition of CAM 12 between Cheyenne, Denver and Pueblo, forfeited by its founders, gave Western Air in December, 1927, an opportunity to try its sales methods in new fields. The territory responded and was built up until it became such an enormous user that it ranked second only to the Los Angeles territory in the amount of air mail sent in proportion to the population.

The fame of the company spread rapidly and Harry F. Guggenheim selected it for an "equipment loan" of $150,000 to establish a model passenger airway as a demonstration of efficiency. With the necessary capital, the company pioneered in the operation of big, roomy and luxurious planes designed to popularize air travel. Manufacturers were asked to bid on the construction of a type of plane which would fly at 120 miles an hour, carry a load of from 2,500 to 3,000 pounds, give a six-hour cruising radius and reach a service ceiling of 16,000 feet. Anthony Fokker met these specifications with his tri-motored F-10, three of which were placed in operation in May, 1928, between Los Angeles and San Francisco.

Shortly after, the company purchased Pacific Marine Airways which was operating from Los Angeles to Catalina Island. Sikorsky amphibions and later Loening amphibions were used.

To build up public confidence in air travel, Mr. Hanshue arranged with the Guggenheim Fund for the Promotion of Aeronautics and the U. S. Weather Bu-

Types of General Aviation aircraft—one of the new Coast Guard flying boats and the YO-27 Army observation plane

reau to establish a complete weather reporting service along the Los Angeles-San Francisco airway. Twenty-two observation stations were originally constructed and weather reports communicated by telephone and radio to meteorologists along the airway, an installation which paved the way for the present widespread airway weather reporting service of the Department of Commerce.

Thousands of pounds of air mail were being flown over the original Los Angeles-Salt Lake City route, but Mr. Hanshue foresaw the need for a more direct route to the east. Painstaking surveys were made during the winter of 1928 and the spring of 1929 for a line directly east through Kingman, Albuquerque and Kansas City, a distance of 1,439 miles. On May 15, 1929, the line began service with multi-motored equipment and agreements were entered into with the nation's railroad services to provide 47-hour air-rail transcontinental travel. The flight from Los Angeles to Kansas City required 12 hours, and the remainder of the journey by rail to New York, 35 hours.

During 1929, WAE perfected a highly-organized network of ground radio stations. Under the direction of Herbert Hoover, Jr., short wave radio apparatus was installed permitting conversation with the scores of company airplanes and also by code between the ground stations. Operations efficiency over the entire system jumped 35 per cent as a result of the new dependability factor. In June a line was opened to San Diego and Agua Caliente, Mexico, while additional schedules brought the daily mileage flown over the system to 7,500 as compared with 2,400 in the previous year. More than 4,700 passengers were carried in 1929.

In the spring of 1930, the Post Office Department indicated a desire to award an air mail contract over the central transcontinental route served by both Western Air Express and Transcontinental Air Transport-Maddux Air Lines. These two companies made a joint bid, and were later awarded the contract. An operating subsidiary known as Transcontinental & Western Air, Inc., was formed to carry out the terms of the contract. Each company owned a 47½ per cent interest in the new enterprise and Pittsburgh Aviation Industries had a 5 per cent interest. All of the assets of TAT-Maddux were acquired in the deal, but WAE retained its Los Angeles-Salt Lake route, its Catalina Island service, and operations in the Rocky Mountain region.

In order to secure necessary cash to form this new operating subsidiary, officials of Western Air Express negotiated successfully with General Aviation Corporation for the sale of a substantial additional stock issue to the latter company. Arrangements were made by which General Aviation Corporation bought approximately a 25 per cent interest in the western company, constituting its initial investment in a mail, passenger and express airline. Two new air mail awards in August, 1931, extended the company's operations from Pueblo to Albuquerque and from Pueblo to Amarillo, and, in addition, the company leased from American Airways the portion of the extension from Albuquerque to El Paso. At the opening of 1932, Western Air was flying 5,106 miles daily and operating air mail routes 4, 12 and part of 33.

Encouraged through its interest in WAE and cognizant of the great increases in all phases of revenue despite unfavorable economic conditions, General Motors through its subsidiary, North American Aviation, increased its holdings Western Air Express to 52 per cent in in the spring of 1933. The motor company, through its subsidiary, General Aviation, also took over a controlling interest in North American Aviation, Inc., in a stock exchange deal, giving it a substantial interest in TAT-Maddux, 100 per cent control of Eastern Air Transport, and with the Western Air Express interest, operating control of TWA.

Today Western Air Express operates two round-trip multi-motored schedules daily between San Diego, Los Angeles, Las Vegas and Salt Lake City, connecting there with United Air Lines' transcontinental service. On the Rocky Mountain division its airplanes fly a daily round trip from Cheyenne through Denver, Colorado Springs, Pueblo, Trinidad, Santa Fe and Albuquerque.

To Western Air Express might well go the laurel leaf for its outstanding operating record. More than 100,000 passengers have been carried since its inception, flying over 14,000,000 miles without a single fatality or serious injury.

Harris M. Hanshue still heads the company, being ably assisted by vice-presidents W. M. Garland and C. E. Wilson: J. C. Felli, treasurer and A. G. Beggs, general traffic manager.

GENERAL AVIATION MANUFACTURING CORP.

The purchase of a controlling interest in the Fokker Aircraft Corporation of America in 1929 by the General Motors Corporation not only signalized its entry into the aeronautical field but also laid the groundwork for the organization of the General Aviation Manufacturing Corporation.

The first airplane embodying Fokker design features manufactured in the United States was a Fokker Standard Universal open cockpit, four-passenger, cabin plane powered with a Wright J-4, nine-cylinder, 210-horsepower engine, delivered almost eight years ago in May 1926 to Colonal Air Transport for operation between New York City and Boston. It was manufactured by the Atlantic Aircraft Corporation of Hasbrouck Heights, New Jersey, organized for the manufacture and sale of Fokker airplanes in the United States.

Previous to 1926 many Fokker airplanes were imported from Nederlandsche Vliegtuigenfabriek of Amsterdam, Holland, the original designers and manufactures of Fokker airplanes. These were distributed in the United States by the Netherlands Aircraft Company of New York City, and the biplane types thus sold included C-II's, C-IV's and the famous D-VII's. Among the monoplanes were the F-III's, characterized by having the pilot's seat alongside the engine, the F-IV's and the well-known F-VII single engine and tri-motor cantilever wood wing, welded steel tubing plane.

In December, 1927, the Fokker Aircraft Corporation of America was formed and it took over the assets of the Atlantic Aircraft Corporation, together with the plants it maintained at Hasbrouck Heights and Passaic, New Jersey. Production was centered on the Fokker Universal, the Super-Universal, F-14 mail plane, and the F-7 tri-motor for the commercial and military markets. Later the F-32 transports and the F-11-A flying boats were built.

In an expansion move, the Fokker company then leased another plant in Glendale, about ten miles from Wheeling, West Virginia, where subsequently were built a number of F-10-A tri-motors. The acquisition of the Dayton-Wright Company of Dayton, Ohio was the last important step taken by the Fokker company before it, in turn, was bought into by the General Motors Corporation.

On June 1, 1930, the name of the Fokker Aircraft Corporation of America was changed to General Aviation Corporation. Previously, the General Aviation Manufacturing Corporation had been formed as a wholly-owned subsidiary to take over the manufacturing activities of the Fokker company.

February 11, 1931, saw the purchase of the assets of the Pittsburgh Metal Airplane Company and the formation of the Metalair Corporation as a subsidiary company of the General Aviation Corporation. In October, 1931, all engineering and production work was centered in a leased plant in Dundalk, near Baltimore, Md., where Curtiss-Caproni was formerly located. The Fokker plants in Hasbrouck Heights, Passaic and Wheeling were closed and the license to manufacture Fokker planes was returned to the inventor.

General Aviation Manufacturing Corporation then undertook an intensive construction campaign, being busily engaged in fulfilling contracts for all-purpose flying boats for the United States Coast Guard and for the YO-27 twin-engined observation planes for the Army.

When the Aviation Corporation of Delaware decided to withdraw from the manufacturing business, it turned over the rights, patents and designs of the Pilgrim 150, a ten-passenger, single-engined, all-metal, low-wing, high-speed plane to the General Aviation Corporation, which it renamed the GA-43.

This airplane was then re-designed and at the present time an order for five is nearing completion. One of these GA-43's was shipped recently to Japan, another will shortly be delivered to the Swiss Air Traffic Company, Ltd., of Zurich, Switzerland, and a third will soon fly over Western Air Express lines. Pan American Airways will shortly take delivery of a GA-43-J seaplane for the use of the Scadta airlines in Colombia.

The GA-43 single-engine, low-wing, all-metal transport has a seating capacity of ten passengers and a top speed of 195 m.p.h. with a sea-level engine. It can be equipped with either a Wright Cyclone "F" engine, or Pratt & Whitney T1C1 Hornet engine.

In April, 1933, the General Aviation Corporation turned over the major portion of its assets, cash and securities to the General Aviation Manufacturing Corporation in exchange for additional stock of the manufacturing company. The stock of the manufacturing company was then exchanged for stock of the North American Aviation, Inc., making General Aviation Manufacturing Corporation a subsidiary of North American Aviation. In June the activities of the B/J Aircraft Corporation, a unit of North American Aviation, were merged with those of General Aviation Manufacturing Corp. by the purchase of B/J's assets.

Today, General Aviation Manufacturing Corporation is centering its activities on the construction of the two types —transport planes and military observation planes. Located adjacent to the new municipal airport in Baltimore, the factory is ideally situated. It contains about 200,000 square feet of space devoted exclusively to manufacturing activities and about 50,000 square feet of space for other endeavors.

The *Berliner-Joyce Aircraft Corporation* (predecessor of the B/J Aircraft Corporation) was incorporated February 4, 1929, and initiated its operations in a new aircraft factory in the spring of that year. Its first plane was a small commercial two-place cabin monoplane, powered by either a Kinner or Warner engine, but the organizers, men of extensive experience in commercial and military aircraft construction, centered their activities around military products.

The Navy gave B/J its first military contract when it ordered, experimentally, the XFJ-1, a single-place fighter biplane featuring a monocoque construction with the gas tanks built integrally. Subsequently, the Navy ordered the XOJ-1, a two-seater observation land or sea plane designed for light cruisers and specially adapted for catapulting, this order being followed by an Army award for a two-seater pursuit job, the XP-16.

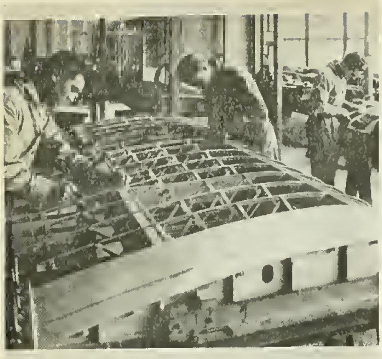
Both the XOJ-1 and XP-16 were completed late in the summer of 1930 and when the latter met with the approval of the Army, 25 were ordered for delivery late that year and the spring of 1931. The XOJ-1 was also found satisfactory in tests and two orders, one for 18 and another for nine, were received from the Navy. One the strength of the development of the XP-type, the company undertook the development of the XF2-J-1, a two-place fighter for the Navy which was completed late in 1933 and is now undergoing its final tests at Anacostia.

The B/J Corporation facilities include not only a modern 50,000 square foot airplane factory situated on the south end of the new municipal airport in Baltimore providing unequalled docking and shipping accommodations, but also a wind tunnel, one of the few wind tunnels owned by aircraft manufacturers in the world, which embraces the latest ideas in construction and equipment and an excellent structural testing laboratory. With these advantages, considerable research has been carried on by the company in a constant effort to improve its products.

The B/J Aircraft Corporation had been organized in June, 1930, by North American Aviation, Inc., to purchase the assets of the original Berliner-Joyce Aircraft Corporation. With the acquisition of North American Aviation by General Motors early in 1933 and the subsequent sale of its assets to the General Aviation Manufacturing Corporation, B/J has been merged with the latter company.

Officers of General Aviation Manufacturing Corporation are E. R. Breech, president and chairman of the Board: Temple N. Joyce, vice-president and general manager; F. S. Hubbard, assistant general manager; J. C. Felli, treasurer; L. R. Beardslee, secretary, and G. M. Darsch, assistant secretary.

B/J aircraft for military use—the Army P-16 and the XOJ-1 for the Navy



The Spartan School of Aeronautics

●

CAPT. JOHN C. CARROLL

Chief Flight Instructor, Spartan School of Aeronautics

Students at work in the Spartan aircraft factory

● Organized in 1928 when Jimmy Haizlip was chief instructor at Spartan, the "Dawn Patrol" of the Spartan School of Aeronautics has since become symbolic of achievement in aviation. More than 400 men and women have worn the silver wings, insignia of the patrol, and of these, hundreds have earned places for themselves in the ranks of aviation.

Five years ago it was difficult for a young man to select a satisfactory, reputable and financially successful aviation school. Only one or two schools, situated in remote parts of the country, were engaged in teaching young men how to fly, but they were new in the business and used "war-time" equipment for training. Fortunately, this type of school has gradually disappeared and in its place we find the modern, well organized and financially stable aviation school of the present day. The gamble and guess-work that once prevailed has vanished.

Today, thanks to the Department of Commerce's Aeronautics Branch, a young man can be practically assured of the quality and amount of training he will receive. Those who are interested in learning to fly or in becoming part of the rapidly growing aeronautical industry, are offered courses of instruction given in all branches of aviation by government accredited schools.

Among the leading schools of this type in the country, the Spartan School of Aeronautics, at Tulsa, Okla., has established an enviable reputation. Located on the municipal airport, which ranks with Newark in the east and Chicago in the middle west in the amount of traffic handled, the students of the school are in daily touch both with the activities of principal airlines and private planes used by business organizations.

So that the student may have available complete facilities for the instruction of all branches of aviation, Spartan has invested more than a million dollars in buildings, motors, planes, equipment and a staff of instructors who teach the most advanced methods used today. The government, in recognizing this investment, has awarded the school the highest possible rating and has licensed its instructors, shops and facilities.

Adjacent to the airport are the school buildings, housing the classrooms, restaurant, motor and airplane shop, test stands and the dormitories. Within a short distance of the field is the Spartan factory, which ranks as one of the most completely equipped aircraft plants in the country, where, as part of their instruction, Spartan students actually construct a full sized airplane under the supervision of the school instructors. Theory is thus proven under actual working conditions, since Spartan aims to train "natural" and not mechanical pilots who are often helpless in an emergency.

Students in the classroom receive instruction in the theory of flight, later being put to actual test in the air under the guidance of the instructor. Meteorology, Navigation and Radio are first taught in the classroom, and the fundamentals later proven in periodic cross-country flights of the "Dawn Patrol", often hundreds of miles over unfamiliar territory and under all possible climatic and weather conditions.

Motors of every type are first studied in the classroom; later disassembled and assembled and checked in actual operation. Planes of every type are studied, and they are actually constructed by the student. Thus Spartan proves under actual conditions what has been taught in the classroom and simulates what will be encountered by the student after he is graduated.

All students are given free room rent at the dormitory, while through the cooperation of the management many others are materially assisted through their courses by part-time work. Other conveniences offered are the use of a bus from the city of Tulsa to the airport and an up-to-date restaurant where students get meals at nominal costs.

Members of the "Dawn Patrol" assembled before one of their flights

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Personairlities

By Caldwell

● A PARTY of archeologists from the Smithsonian Institution, searching for relics of prehistoric man, ran across an interesting specimen near Detroit—a dawn man of the pre-historic era, not merely in an excellent state of preservation, but actually walking around. This early vertebrate was discovered lurking about the Packard Motor Car Co., apparently examining the sky. When questioned, the ancient admitted that he was about to get into an airplane and go some place, when the weather cleared—there was one small cloud in a corner of the county, and he was awaiting its departure. Further interrogation elicited this remark: "I don't want to be the best pilot in the world—merely the oldest." After this assertion, the ancient mammal scuttled into a nearby cave, leaving the scientists in a fever of excitement. Further research demonstated that he must have been born during the Ice Age; that is, the first Ice Age, which should not be confused with the Second, or Ice-Cube Age of electric refrigeration. The name of this exceptionally well preserved exhibit is Walter E. Lees, who as a child, eons ago, rode the eohippus and the hairy horn-toed elephant, and in his youth hunted the carnivorous heebee-geebee and the sabre-toothed hinky-dink.

The early history of this practically extinct mammal is shrouded in the mists of antiquity, which perhaps is just as well. But, oddly enough, he refuses to admit that he antedates the Java ape-man by thousands of years, and claims that he was born at Janesville, Wisconsin, July 16, 1887. Of course, this is manifestly absurd, even if you make it 1887 B. C. However, just to humor the old fellow I'll write him up only from his admitted historical period, and pretend that for 22 years he was growing from childhood to manhood, which brings us to 1908, when he exposed himself to the undermining influence of an engineering course at the University of Wisconsin and turned his attention to mechanical objects. This was the beginning of the end. At Ashland, Wis., in 1911, he was out hunting the side-hill gouger, a fur-bearing horned animal, when he was startled by the approach of an airplane piloted by Beckwith Havens, another prehistoric anthropoid. This episode sunk Old Man Lees in the morass of early aviation; he decided to become a pilot, and that finished him as a citizen headed for wealth and a life of accomplishment.

In 1912 he paid $250 for two rides in an old biplane with Otto Brodie at St. Augustine, Fla. He thought he was paying for a whole flying course, but the school's manager suddenly departed with all funds and all speed, leaving Brodie and his pupils somewhat non-plussed, so that ended the course. Lees went to St. Louis and the Benoist Aircraft Co. as mechanic for Tony Janus, Red Bleakley and Ray Benedict, almost learning to fly in occasional dual hops, and making his first solo, by mistake, in the fall of 1912. He had been sent out to taxi around on Creve Coeur Lake, when suddenly the plane on floats jumped off the lake before Lees knew it. By mistake he landed safely. All early flying was done by using a mixture of luck and Divine Guidance, in equal proportions. Those were great days, and men were men—if they survived.

Walter Lees

Old Man Lees went to Florida with Benedict, who fired him for going solo again without permission. But you couldn't keep Lees down. He beat it back to St. Louis, became mechanic for T. S. Duby, who owned a seaplane that he couldn't fly. Lees learned to fly it before the owner did, so Duby let him fill an exhibition date at Salem, Mo., though he insisted on riding as a passenger and posing as the pilot. His deceit was his undoing. The largely amateur Lees got the plane up to a hundred feet, stalled it, and the whole contraption came down, putting a large dent in Dent County, Mo., and several dents in the two aviators. That stopped Duby, but it only spurred the heroic (or possibly insane) Lees on to greater endeavors. He went to Chicago in 1913, sold shoelaces and automobiles, and watched the flying of Katharine Stinson at old Cicero field, then borrowed $300 from a trusting soul and went to San Diego to the Curtiss Flying School, where Ray Morris was pilot and instructor. He paid for part of a course, worked as a school mechanic, took instruction, and before he had even gone solo with all this aerial knowledge he received a wire from Jack Vilas at Chicago, offering him a piloting job on a home-made Curtiss flying boat. Being an early aviator, and bold as the deuce, Lees departed for Chicago, a finished pilot, all but the solo part of him. He leaped into the air, stalled, recovered, flew on, wobbled a bit, called briefly on Lady Luck, Allah, and any kindly Deity who happened to be about, and came down for a landing, straining the bottom of the craft slightly, but, being forgiven, as this was a common occurrence, even to the experts of that time.

This was in 1915. After some flying around Chicago his old instructor, R. V. Morris, induced the Curtiss Co. at Buffalo to put Lees on as an instructor. There he taught quite a few students, including himself, for he was still learning. Al Johnson and Fish Hassell were two of his pupils. In December, the Curtiss Co. sent him to Newport News with that grand old man of the air, Captain Thomas S. Baldwin, in charge. The instructors at this Atlantic Coast Aeronautical Station in 1916 were Vic Carlstrom, Vic Vernon, Steve MacGordon, Jimmie Johnson, Stew. Cogswell, Bert Acosta, and Carl Batts. They taught many Canadians, who went back to Canada and joined the Royal Naval Air Service or the Royal Flying Corps, a gallant group of young men, most of whom died in the service of King and Country.

Among Jimmie Johnson's pupils was General William Mitchell, then a Major. Jimmy had him up to the last five or six hours, then Lees got him and soloed

(Continued on following page)

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• BOEING HAS ALWAYS BUILT •
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(*Continued from preceding page*)

him successfully. But when Johnson sent him up solo a week later, the Major forgot to level off, and landed on his back. You know, nobody's a hero to his valet, and no General is a hero to his flying instructor; he's just another pupil.

When the United States furiously (and atuously) dashed into war, the school was disbanded, the students sent to Army schools. Lees went in as chief flying instructor and taught at the following fields: Ashburn, Chicago, Chanute, Selfridge, Ellington, Gerstner, Brooks, finishing the last eight months of the war as a test pilot at McCook Field. After the war he went with the Packard Company for two months, rejoined Curtiss, and flew in the Northwest. Lees then went to Dayton, joined the Johnson Airplane and Supply Co., instructed, carried passengers, tested planes for Bill Stout in Detroit and won commercial races in St. Louis and Dayton with a Hartzell plane. On Friday, the 13th of May, 1924, he tested a German L. V. G., found it impossible to land because of a distortion of the wing, jumped at 200 feet, pulled the rip cord of his Irvin chute, and abruptly joined the Caterpillar Club.

In April, 1925, he joined the Packard Motor Car Co., as engineer in the Aeronautical Department. As Field Representative he delighted at first to take Packard engines apart and put them together again for the entertainment of himself and the onlookers. But he soon learned to look wise, shake his head, make suggestions, but never touch the engine himself, thus graduating into the class of Spoons Boedecker, who can look at an engine more knowingly and do less manual work on it than any man in the business.

Walter Lees took mental care of all the water-cooled engines that Packard put in the field, and when the Diesel radial appeared he was assigned to flight test it. With it, on May 28, 1930, he and Fred Brossy broke the world's duration record with 84 hours 32 minutes without refueling, a record that I believe still holds. He has had 650 hours' flying with Packard Diesel engines, has more than 6,000 hours in all, and is still with Packard, apparently as much a fixture as the radiator on the Packard car. Here, looking sternly at an engine, admonishing it to behave itself, we leave Old Man Lees. He toils not, neither does he spin, yet Solomon never spoke with more authority and knowledge—or performed less actual hard labor. His first Aero Club license, No. 44, is dated Sept. 1915; he still holds his Transport License, so by next fall he will have held a pilot's license and used it actively for twenty years. He's so safe and cautious that even Dick Depew and I would let him fly us around—and I can't say more for any pilot than that.

• CHARLES N. (JIMMY) JAMES, operations manager for the San Diego—Los Angeles—Salt Lake City route of Western Air Express, was born at Springdale, Iowa, Feb. 11, 1898, run through the local educational rolling-mill at Pasadena, Cal., and turned adrift after a year in high school with a casual blessing from his instructors, who were glad to have done with him at the age of 15. Somehow, he didn't take to book larnin', which he considered a waste of time for a boy who had a hankering for mechanics—and so do I. Oh yes, I know all about the modern fetish of Higher Education, and of course if you're preparing for one of the professions, you have to absorb it. But in these hard days, if you're a husky chunk of a lad, you will be taking a burden off the Old Man's shoulders if you hop out and get yourself a job, and continue your studies outside of school. Why, I didn't even learn to read and write until after I left school, where I spent nearly all of my time raising hell in my childish way. And look at Henry Ford. He didn't have to go to college, because he had to go to work so early in life. Now if he wants to know anything they teach at Harvard he simply asks one of the thousands of college graduates he has working for him by the day. Even with their diplomas and their fraternity pins, Henry is still several jumps ahead of them. However, I'm sometimes sorry that I didn't go to college, myself, because I'm a natural born loafer, and in a college my natural instincts might have been developed still further. Who knows?

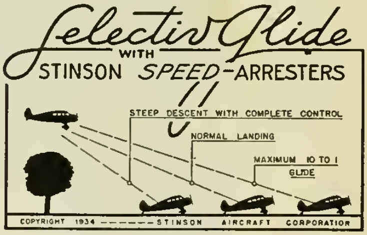
"Jimmie" James

Jimmy James, back in 1913, went to work as a grease monkey for his cousin who did automobile racing, spent some time around the dirt tracks, and then left to herd tractors on California ranches. This gave him such a sound mechanical training that when war broke out he was able to enlist, April 6, 1917, as a mechanic in the 33rd Aero Squadron of San Francisco. After a few months' training he embarked on the *Baltic* with 3,000 other idealists bound for the war. His commander was Major Carl Spatz, who was in charge of eight squadrons on the trip across. Eight hours out of Liverpool, Jimmy had his one and only experience under fire: a German submarine took a dirty crack at the *Baltic*, which started to list and gave every indication of being bound for the bottom. The troops took to the life boats; but after the extent of the damage to the ship had been ascertained, they were ordered back, and the *Baltic* limped into Liverpool with a heavy list to port, scuppers awash, and a yo ho ho, a hey nonny nonny and a hot cha cha!—unless, not being a graduate of the Naval Academy, I have my sea terms slightly mixed.

On the other side, Jimmy took a three months' course on all types of aircraft engines at the Central Flying School, Upavon, England, and during November and December of 1917 was given an advanced course at the Rhone motor factory at Lyons, France. From January, 1918, until the following January he was in field service at Issoudon, France, doing trouble shooting, looking after forced landings, and crashes. In this way he saw a lot of France, for with the interesting engines of those days the boys were always landing all over the place, especially near interesting looking chateaux.

Thus the war passed on, very pleasantly and happily, as it did for all air

(*Continued on page* 71)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AVIATION ENGINEERING

TECHNICAL EDITORS: GLENN D. ANGLE • PROF. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

Uses of Felt in Aircraft Construction

FREDERICK K. TEICHMANN
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● An analysis of the applications of felt in the various parts of the aircraft structure shows a wide variety of use. The reasons for using this material depend upon the results desired—weather proofing, heat insulation, sound insulation, vibration damping, etc.

In order to give an idea of the wide range of application of felt a few will be mentioned here.

The mounting of fuel tanks in aircraft is of particular importance, since a relatively large load has to be supported over a comparatively small surface, and still not be subject to a great amount of vibration, chafing, etc. The cradles supporting such tanks are usually lined with a good grade of felt of ¼, ⅜, or ½" thickness. In order to make the felt waterproof (as well as proof against oil and gasoline) felt used around the tanks is often covered with waterproof duck.

Fuel and oil lines are supported at regular intervals with felt, which helps to damp out vibration to prevent chafing. It has enough resiliency to avoid shock loads breaking the piping. For severe weather operations the entire fuel systems have been wrapped in felt to increase operating temperatures. A self-lubricated engine control system has been obtained by permitting the control rods to pass through felt saturated in oil. No binding is caused since the felt support is flexible.

For lining cabins felt helps to insulate against cold, and in soundproofing. Reference to the latter use appears in the resumé of the tests. One suggestion for felt lining the cabin is to use a layer of ⅛" felt, a sheet of 1/16" spruce plywood, and then 1/32" felt. These layers are usually glued together to give a composite panel which may be easily handled.

All wool black felt covered rubber channels are excellent for lining window frames against vibration and weather insulation. It stands up particularly well where windows are being raised and lowered frequently.

Similar use of felt may be made around other openings such as doors, access plates, inspection holes, etc.

Delicate instruments rely upon felt washers and gaskets for shock absorption, vibration damping, and particularly for dust seals.

Engine manufacturers have used felt for some time as lubrication retainers for roller bearings, valve gears, gear housings, etc. Tests made to determine the best qualities of felt for this purpose are included in this article.

Additional miscellaneous examples that may be cited are: felt supports for aircraft chairs, brackets, etc.; lining between metal cowls where vibration and wear are likely to take place; padding of chairs, and fillers for cushions; lining of dollies used to transport floats and hulls; for parachutes; lining of flying suits, boats, gloves, and helmets.

Canvas-covered felt strips for a fuel tank on the Curtiss XF9C-2

There is a wide variety of felt available for so many uses and some grade of felt best for each use. The aircraft industry has used felts for some time, but very often a particular specification has been based upon "tradition" rather than upon actual knowledge.

With this in mind, as well as to increase the available data on felts, a series of tests was conducted at the Daniel Guggenheim School of Aeronautics, New York University, for the Felters Company.

Descriptions of Felts

The grades of felts used are described in the table below. They have been given a letter for purposes of identification in the various tests made, and cover the range of those commonly used in the industry.

Table 1—Grades of Felts

Sample	Commercial Name	Approx. lbs. sq. yd. ¼" thick	Approx. % Wool Content
A	Cotton & Wool Pad	2⅛	85
B	All Wool Pad	2⅛	95-100
C	Wool Backcheck	3¾	95-100
D	All Wool Pad	2⅛	100
E	All Wool Backcheck	4¼	100
F	Soft Laundry	3	100
G	Laundry	4⅛	100
H	Grey Packing	1½	35
I	White Athletic Pad	1¼	25
J	Grey Packing	1¾	35

Oil Retaining Properties

For washers or felt pads used to retain oil for lubrication of bearings, shafts, etc., some felts are better than others. A series of oil retaining tests were made by timing the filling of a flask of 60 c.c. volumetric capacity with oil (an aviation engine oil of .889 specific gravity was used) which passed through a felt pad placed at the lower end of a 2" diameter tube. The average pressure upon the felt was kept constant at 1 lb. per sq. in. and the average time (in seconds) for filling the flask is given in the following table:

Table 2—Oil Retention

	Thickness		
Sample	(seconds) ⅛"	(seconds) ¼"	(seconds) ½"
A	32	50	143
B	39	. .	125
C	166	329	463
D	30	78	167
E	108	492	630
F	67	158	310
G	395	. .	720

The retention of oil by the felt is dependent upon thickness, density and quality. Sample G (called "Laundry" felt) retained oil best. This is the densest of the felts tested, weighing approximately 4.125 lbs. per sq. yd. for a thickness of ¼" and is useful for lubrication of rocker arms, rotating shafts, etc.

The property of retaining oil is not sufficient in determining what felt is best for that particular use.

The oil absorption property is equally important. To determine how fast the felt would absorb oil (of specific gravity .89), specimens of ¼" × 1" × 4" were immersed in 3/16" of oil measured at the end of 20 minutes and at the end of one hour.

Table 3—Oil Absorption

Sample	Oil rise (20 min.) (inches)	Oil rise (1 hour) (inches)	Weight of dry felt (grams)	Proportion of its own weight of oil absorbed
A	1¼	1⅝	2.95	2.44
B	1¼	1⅝	3.35	1.94
C	1⅛	2	6.80	1.84
D	1 3/16	1 5/16	3.20	3.13
E	1	1⅞	7.00	1.83
F	1 3/16	1 11/16	5.85	2.91
G	1¼	1¾	4.95	3.19

The relative amount of oil absorbed by the felt samples is practically in the same proportion to oil retaining properties.

Another test to determine the oil retaining properties of felt was made by determining the amount of oil seepage past a felt collar around a vertical rotating shaft (driven by an electric motor). A constant weight of oil (25 cc.) was kept above the felt collar so that constant pressure was maintained.

Table 4—Time of Seepage (Seconds)

Sample	Thicknesses ½″	¼″	⅛″
A	283	120	67
B	319	140	439
C	808	421	225
D	311	172	127
E	820	634	343
F	406	265	175
G	464	502	608

Friction Test

The amount of friction of the felt fabric on different materials will indicate its usefulness for, for example, supporting fuel and oil lines.

A rectangular piece of felt was attached to a sliding block which was placed on an inclined plane whose face was covered either with smooth metal, wood, or glass in order to determine the coefficient of friction of the felt on these surfaces. The coefficient of friction was taken as the tangent of the angle of the inclined plane when the sample began to slide with the assistance of slight tappings on the plane. The coefficient of friction is independent of the area, and weight providing the pressure of one surface on the other does not modify the original surface characteristics of the sample tested.

Table 5—Felt Friction Coefficients

Sample	Smooth wood	Plate Glass	Dry Smooth metal	Oiled Metal Surfaces A	B	C	D
A	.352	.220	.198	.176	.178	.259	.259
B	.340	.236	.208	.175	.176	.231	.231
C	.362	.253	.216	.178	.178	.240	.231
F	.382	.272	.222	.178	.178	.240	.222
G	.420	.289	.240	.176	.176	.259	.249

A—"Thin" aviation engine oil applied to smooth surface, felt dry.

B—"Thin" aviation engine oil applied to smooth surface, felt saturated with oil.

C—"Thick" aviation engine oil applied to smooth surface, felt dry.

D—"Thick" aviation engine oil applied to smooth surface, felt saturated with oil.

The results of these friction tests show only a slight difference in the value of the coefficient of friction between the various grades tested for any particular type of surface. For dry surfaces, the coefficient of friction increases with wool content and density.

For rotating shafts the felt having the lowest coefficient of friction would absorb the least power. This friction coefficient of felt on oiled surfaces is practically independent of the grade of felt used, but dependent upon the viscosity of the oil.

Table 6—Miscellaneous Friction Coefficients

Surfaces and Materials	Coefficients
Leather on oak	.27 to .38
Leather on metals, dry	.56
Leather on metals, wet	.36
Leather on metals, oily	.15
Woolen cloth on woolen cloth	.435
Hemp on oak, wet	.33
Hemp on oak, dry	.53

Mark's Handbook shows that the coefficient of friction of felt on wood (dry) is approximately the same as leather on oak (dry); but is less for felt on metal or glass. Leather on oily metal is somewhat lower than for felt on oily metal. Inasmuch as the viscosity of the oil also seems to be a factor, the lower value may be due to the grade of oil used.

Wear Tests

Wherever felt is used to support control cables, wear takes place in the felt. Other cases of wear can be found.

Each specimen, 4″ square, was loaded at 19.3 grams per sq. in. and then subjected to a linear motion of 180 ft. per min. on a roughened wood surface for various timed intervals. The samples were tested at the same time in order to keep the conditions the same throughout. A coefficient, C_w, was determined from the following relationship:

$$C_w = W_L/TV$$

where C_w = wear coefficient

W_L = Loss in weight in grams from original weight of specimen over a certain timed interval.

T = Time in minutes.

V = Velocity of the specimen over the surface in feet per minute.

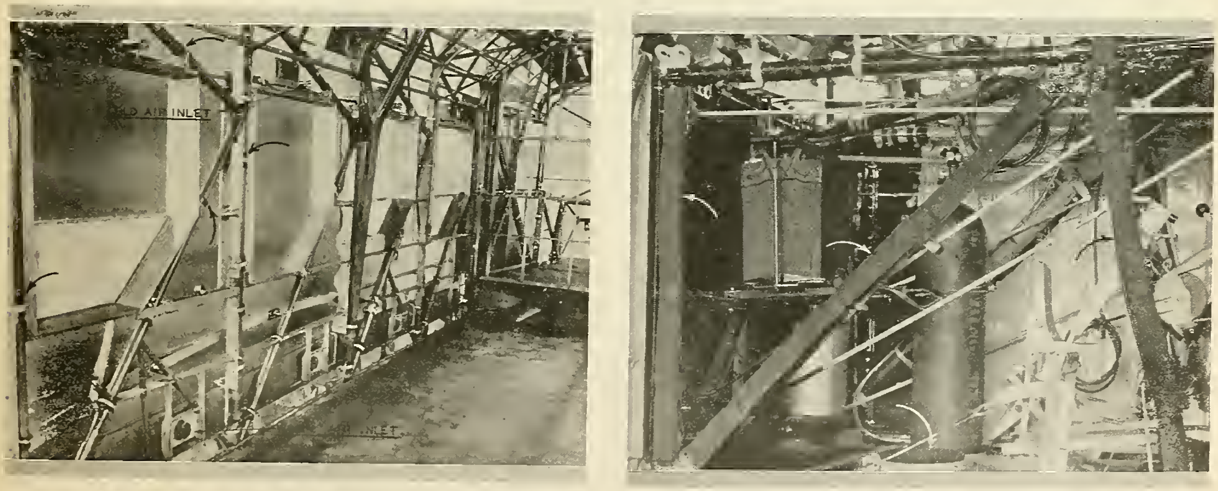
Table 7—Wear Coefficients

Time (minutes)	Sample A	Sample B	Sample G
10	20.4	23.6	48.4
25	16.7	21.5	47.9
45	12.0	18.4	47.3
60	8.5	16.0	46.7

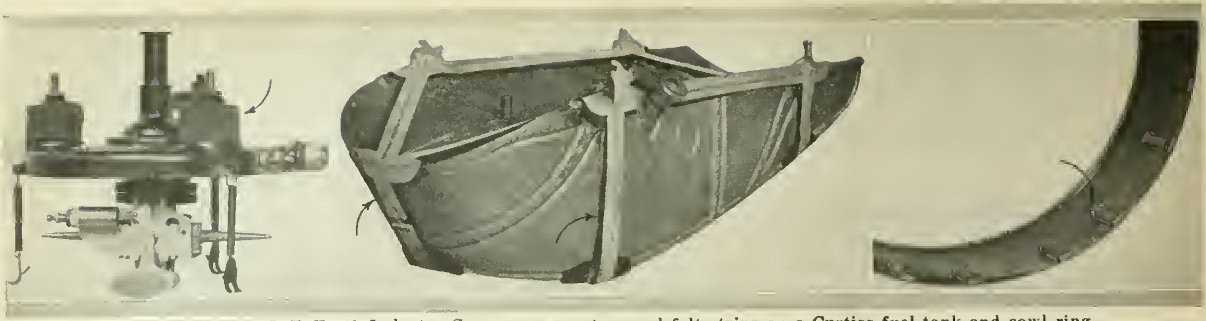
The wear varied with the quality and with the density of the felt.

Resiliency

The resiliency of felt is most important when felt is used as a chafing strip in supporting gasoline tanks, etc. In such installations it is desirable that the felt deform as little as possible so as to obviate the necessity of frequent adjustment of supporting straps or replacement due to deformation of the felt under load.



Felt padding of Curtiss Condor frame members and felt strips for fuel and oxygen tanks on the Navy Hell Diver



Felt washers on a G. E. Earth Inductor Compass generator, and felt strips on a Curtiss fuel tank and cowl ring

Tests were made on three different grades to determine deformation under load, and permanent deformation. The average results on two samples are given below:

Table 8—Deformation

Sample	Original thickness (inches)	Thickness under load (inches)	Deformation (inches)
E	.500	.275	.225
D	.490	.140	.350
D	.480	.180	.300
A	.470	.130	.340
A	.475	.125	.350

Sample	Under load in % of orig. thick.	Permanent (inches)	Deformation in % of orig. thick.
E	42.2%	.095	19%
D	.....	.150	30.6%
D	.....	.150	31.3%
A	.....	.170	.....
A	.....	.165	.....

The harder the material, and the better the quality of felt, the less deformation the material will take.

Heat Transmission

The insulation, or heat transmitting properties, of the felt is of particular interest at the present time when more and more consideration is being given to the heating and ventilating of aircraft cabins.

In order to obtain the properties of the felts, a box whose sides were of the same grade felt was made up and the heat transmission coefficient (which is the amount of heat in B. T. U. transmitted per square foot per hour per degree F.) difference between inside and outside temperatures, based on a temperature gradient for 1" thickness was determined. For testing other grades, the sixth side was made of the desired material.

The temperature difference between outside and inside temperatures was maintained at 70°.

Table 9—Heat Transmission Coefficients

Sample	½"	¼"	⅛"
A	0.253	0.297	0.
D	.220	.272	0.155
E	.133	.182	.1425

Coefficient referred to 1" thickness. The heat transmission decreased with wool content and density. It is, therefore, desirable to use a felt with large wool content and high density.

Tensile Tests

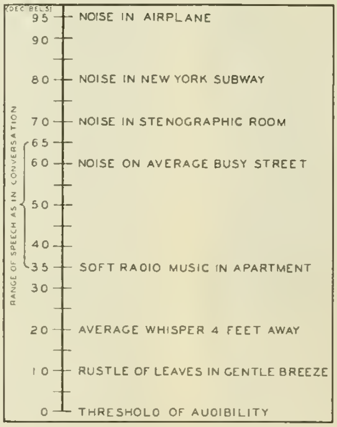
Additional tests for the tensile and tear strength were made in order to furnish data to designers who may wish to use felt where the tensile and tear strengths are important.

Felt samples 7" long, 1" wide were used for the tests.

Table 10—Tension Tests

Sample	Cut	Ultimate load (average)	Area (sq. in.)	Tensile strength (lbs. sq. in.)
A	Lengthwise	57	.25	228
A	Crosswise	41	.25	160
B	Lengthwise	19	.25	75
B	Crosswise	31	.25	125
B	Crosswise	50	.375	133
C	Lengthwise	133	.25	530
C	Crosswise	129	.25	515
D	Lengthwise	122	.25	488
D	Crosswise	97	.25	402
E	Lengthwise	246	.25	985
E	Crosswise	173	.25	693
F	Lengthwise	217	.25	866
F	Crosswise	127	.25	506
G	Lengthwise	242	.25	968
G	Crosswise	217	.25	868

The tensile strength of felt is greater lengthwise than crosswise, and also increases with density and quality.



Noise levels in terms of decibels

Tear Tests

For testing, the samples were partly split at one end to give two tongues, one of which was fastened in a fixed jaw clamp, the other in a movable jaw clamp to which loads were applied until the specimen began tearing.

Table 11—Tearing Tests

Sample	Cut	Tearing Loads (Average)
A	Lengthwise............	4.18
A	Crosswise	2.94
B	Lengthwise............	2.63
B	Crosswise	4.50
C	Lengthwise............	16.75
C	Crosswise	15.40
D	Lengthwise............	4.88
D	Crosswise	4.56
E	Lengthwise............	22.75
E	Crosswise	23.06
F	Lengthwise............	17.13
F	Crosswise	12.39
G	Lengthwise............	16.54
G	Crosswise	21.69

The resistance to tearing varies with the density and quality of the material.

Soundproofing

Since weight must be considered in the design of aircraft, it is desirable to have a material which is not only a good heat insulator but also a good soundproofing material, so tests were made on various felt samples to determine the soundproofing characteristics.

For these tests, to determine the noise reduction, or decibel decrease, a simple set-up was used as follows: a rectangular box, with two equal compartments, was constructed of a fibrous material of relatively good soundproofing qualities. In the partition dividing the two compartments, a window, about 21" square, was placed in the frame of which the various specimens could be placed.

In one compartment the source of sound was located. It consisted essentially of a radio speaker from which noise of a known frequency emanated, supplied through phonographic connections.

In the other compartment, a meter was placed which measured the noise level. The noise level was measured in terms of decibels before and after the specimen was in place.

Figures in brackets (Table 12) indicate decibel drop when noise outside box was 80 decibels instead of 90 decibels. It was not possible at the time of this test to attain a noise level of 90 decibels for frequency 2,000. Samples X, Y and Z are commercially available soundproofing materials used for aircraft cabins.

Samples X, Y and Z are used quite extensively at present. They have high soundproofing qualities for their weight. They tear comparatively easy, and therefore are not desirable where wear is likely to take place. They must therefore be placed in unexposed locations, so that their range of application is relatively small.

The felts are good soundproofing materials, but their choice depends entirely upon the particular problem encountered.

Some of the heavier felts have excellent soundproofing qualities when used alone, but the weight would make extensive use of felt C, for example, almost prohibitive for aircraft; yet because of its flexibility, strength and close texture, it is excellent material for window and door strippings, mountings for instruments, lining fuel tank cradles, etc. Although a study of these uses indicates that they were primarily chosen for wear, chafing, shock absorption, etc., they are also excellent for these particular applications for reducing sound, since they reduce or eliminate extensive vibration.

It will be noted that felt I is a good sound absorbing material compared with samples X, Y and Z. It would lend itself admirably, then, for lining aircraft cabins where much surface has to be covered without too great an increase in weight. An increase in thickness of the felt I shows an appreciable increase in the decibel drop.

Most soundproofing materials show better sound absorption characteristics at one frequency than another. This makes imperative the use of a combination of materials in order to reduce the general noise level.

It is for this reason that a plywood specimen in conjunction with sample X and then with felt I was tried. The plywood plus felt gave the greater decibel drop, although sample X indicated a greater decibel drop when used by itself.

Felt I is, therefore, an excellent material to use in conjunction with plywood for lining the cabin, for soundproofing purposes. It is known as a "white athletic pad" type of felt.

Wherever material is employed for soundproofing, it is important to know the frequencies encountered. For isolating machinery, the problem is usually simple, since usually only one frequency is encountered, and therefore one material will do. In such a case that material is chosen which has the greatest sound absorption for its weight, cost, wear, resiliency or whatever other factors have to be considered.

Digest of Technical Articles from Foreign Publications

ELSA GARDNER

Magnesium Alloys

Light Alloys for Aeronautical Purposes with Special Reference to Magnesium, L. Aitchison. Royal Aeronautical Society Preprint for Meeting December 14, 1933, 10 figs., 26 tables.

ALLOYS rich in magnesium are considered and fundamental data given which may be of definite service to the aeronautical engineer. Mechanical possibilities of alloying different elements with magnesium are shown and results compared with those obtained from aluminum alloys. The author notes the fact that magnesium differs from other principal engineering construction materials by crystallizing in the hexagonal system. This has a very definite bearing upon the capacity for distortion and upon the mechanical properties following from the crystalline orientation in any given piece of material. He points out that in both cast and wrought form magnesium alloys possess properties which render them useful as aeronautical materials.

He explains the necessary technique for producing welds in magnesium alloys and compares it with that used for aluminum. He takes up the resistance of magnesium alloys to corrosion and describes a chromating process developed by Sutton of the Royal Aircraft Establishment for protecting them. Among other applications he recommends these alloys for propellers. He concludes with a discussion of the effect of magnesium on the mechanical properties of aluminum and shows that alloys of aluminum rich in magnesium, but free from other elements, are able to resist corrosion more satisfactorily than any other known alloys having aluminum as a basis.

Aluminum Bronzes

The Aluminium Bronzes, E. C. J. Marsh and E. Mills. Aircraft Engineering, Vol. 5, Nos. 57 and 58, November and December, 1933, pp. 251-255 and 286-288, 12 figs., 2 tables.

PHYSICAL and mechanical properties of aluminum bronzes are surveyed. The authors devote the first installment of the article to the composition of these bronzes, the effects of adding iron, commercial forms, sand and die casting procedure, surface protection, forging and machining. They discuss the equilibrium dia-

Table 12—Sound Proofing Qualities

Specimen	Approximate thickness (inch)	Weight per sq. ft. (ounce)	Decibel drop for frequency (noise level 90 decibels)				Wt-decibel ratio. Oz. per decibel for frequency			
			250	500	1000	2000	250	500	1000	2000
Plywood and Felt I....	⅝	13.9	15.5	20.	19.	27.5	.897	.695	.731	.506
Plywood and Sample X	½	14.9	16.5	24.	20.	24.5	.904	.621	.745	.609
Plywood	¼	12.3	14.5	19.	18.	21.	.849	.648	.684	.586
Felt C	½	12.9	12.	13.	16.	18.	1.075	.993	.806	.717
Balsa	½	7.3	12.	15.	15.	19	.608	.487	.487	.384
Felt A	½	7.3	1	2	7	6	7.3	3.65	1.042	1.217
Felt C	¼	6.4	7	6	10	10	.914	1.067	.640	.640
Felt J	½	5.1	6	4	9	11	.850	1.275	.567	.464
Felt A	¼	3.9	2	4	11	9	1.95	.975	.355	.433
Felt J	¼	2.9	2	1	5	5	1.45	2.9	.580	.580
Sample X	¼	2.5	7	7	12	21	.357	.357	.208	.119
Sample Y	9/32 (3 layers)	2.3	4	4	11	16	.575	.575	.209	.144
Felt I	⅛	1.5	2	3	6	6	.75	.500	.250	.250
Felt H	⅛	1.3	0.5	1	2.5	2	2.600	1.3	.52	.650
Sample Z	⅛	1.0	2	1	5	12	.5	1.00	.200	.0834
Sample Y	3/32	0.75	2	1	5	5	.375	.75	.15	.15
Felt I	⅛ (1 layer)	1.5	2	3	6	6	.750	.500	.250	.250
Felt I	¼ (2 layers)	3.0	3.5	4.5	10.	(4)	.857	.667	.300	(.750)
Felt I	⅜ (3 layers)	4.5	6.0	6.5	12.5	(6.5)	.750	.692	.360	(.692)
Felt I	½ (4 layers)	6.0	8.5	9.5	13.5	(10.5)	.706	.632	.445	(.571)

gram, and treat briefly the mechanism of the solidification changes and the property of each metallographic constituent.

The second installment deals with the structural effects of heat treatment as well as the best procedure and results of self annealing, cleaning, pickling and finishing. Applications and advantages of these metals are pointed out and their corrosion resistance compared with that of other non-ferrous alloys. The authors believe that their resistance to fatigue, abrasion and corrosion make them reliable materials for aircraft.

Aerodynamics

Small Motions of an Infinite System of Vortices around a Position of Equilibrium (Sur les petite mouvements d'un système infini de tourbillons autour d'une position d'équilibre), G. Durand. Publications Scientifiques et Techniques du Ministère de l'Air Service des Recherches de L'Aéronautique, No. 35, 1933, 22 pp.

AFTER a preliminary study of the theory and a calculation of the velocities for a single row of vortices, the author reviews the problem of stability for two parallel rows of alternate vortices. He concludes that the figure formed by two rows of alternate vortices, parallel and indefinite in two directions, does not act on the absolute stability as one can find an infinity of the initial displacements for which the vortices are removed indefinitely. In order to explain the experimental stability, observed in the experiments of Henri Bénard, he thinks it is necessary to take into account the fact that, in reality, one modifies initially only a restricted portion of the fluid, so that a small number of vortices alone possess an initial displacement.

Ground Effect

The Lift on a Flat Plate Placed near a Plane Wall with Special Reference to the Effect of the Ground upon the Lift of a Monoplane Airfoil, S. Tomotika and Y. Takenonti. Tokio Imperial University, Aeronautical Research Institute—Report No. 97, August, 1933, Vol. 8, No. 1, August, 1933, 60 pp., 5 tables, 8 figs.

LIFTING force acting on a flat plate set in a semi-infinitely extended stream of an incompressible perfect fluid at a place not far from its boundary plane wall is calculated under the conditions that the fluid at infinity flows with a constant velocity parallel to the wall, and that the angle of attack of the plate is an acute angle. Theoretical results seem to explain the experimental fact that there is more or less increase of lift acting on a monoplane airfoil near the ground, if the angle of attack is not too large. For a given distnce of the airfoil from the ground, the larger the angle of attack, the smaller the amount of increase of lift due to effects of the ground, while if the angle of attack is large, the lift is rather decreased, due to the presence of the ground. The Appendix contains a calculation of the force acting on a plate following Cisotti's idea.

Light Transmission

On the Transmissibility of Visible Light through a Cloud of Particles, D. Nukiyama. Tokio Imperial University, Aeronautical Research Institute—Report No. 98, Vol. 8, No. 2, December, 1933, 100 pp., 22 figs.

SPECIAL photographic methods of measuring the relative intensity distribution of scattered rays from a cloud of particles are described, and the results of measurements of incense and NH_4Cl particles are discussed. It was found that backward scatttering diminishes as the wave length of the incident rays becomes longer. For longer wave length of the incident rays, the point of minimum scattering becomes less definite than in the case of shorter wave lengths. Short discussions on scattered energy follow, results of which show that the amount of scattered energy is far greater than that theoretically expected.

Engine Prospects

Possible Future Developments of Air-Cooled Aero Engines, A. H. R. Fedden. Royal Aeronautical Society Preprint for Meeting December 7, 1933, 32 pp.

THE DIRECTION which the development of four-cycle air-cooled engines will take in the next ten or fifteen years is predicted and the present situation is reviewed. The author discusses the improvements that can be made with increased compression ratio, fuels, supercharging, engine cooling, increase in rotational speed, lubrication, compression-ignition, direct gasoline injection, two-stroke cycle, sleeve-valve mechanism, obtaining the maximum thrust efficiency from available brake horsepower, and development of engine materials. In summarizing the important factors governing aircraft-engine design, the author divides it into six categories, namely, sports and training light-type engine, small civil type, intermediate civil and military type, current type military and airliner engine, high-power, high-efficiency military type and large flying-boat and large airliner type.

Variable-Pitch Propellers

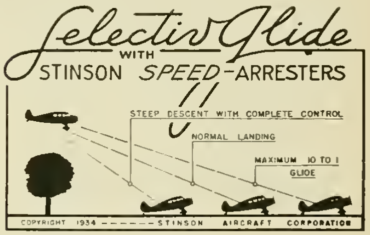
Variable Pitch Airscrews and Variable Gears, W. G. Jennings. Royal Aeronautical Society Preprint, 13 pp., 7 figs.

AERODYNAMIC ASPECTS of the problem of the variable-pitch propeller are discussed and the possible advantages that may be gained by substituting this type for the normal fixed-pitch propeller are reviewed. The author takes up the effect on maximum level speed and maximum rate of climb and calculates the variation of static thrust with change of pitch as well as the effect of pitch variation on take-off thrust, on range and on high-speed dives. He then briefly compares the effect of a variable gear on certain items of performance with the effect of pitch variation.

French Research

Aeronautical Research in the French Scientific Field (La recherche aéronautique dans les milieux scientifiques français), P. Léglise. L'Aéronautique, Vol. 15, No. 173, October, 1933, pp. 227-233, 24 figs.

THIS CONTINUES a review of French aeronautical research and is devoted to results obtained by technical schools located in Marseilles and Nantes. In covering the work at the Institut de Mécanique des Fluides de Marseille, the author describes the aerodynamic research undertaken by J. Valensi, as well as that of J. Peres and L. Malavard on the fundamental problem concerning the theory of a wing with finite span, and refers briefly to the work of the Institut de Mécanique des Fluides de Toulouse. The greater part of the article gives the work carried on by the Institut Polytechnique de l'Ouest under the direction of Le Rolland. The author discusses in detail the hardness-testing pendulum designed by Le Rolland and Fournery and experiments of Le Rolland and Sorin on the rigidity of beams and complex connections. He takes up also the aerodynamic study of Luneau on the resistance of air in oscillatory motion and the research of Fournery on the physical properties and mechanics of antifriction metals and their lubrication.



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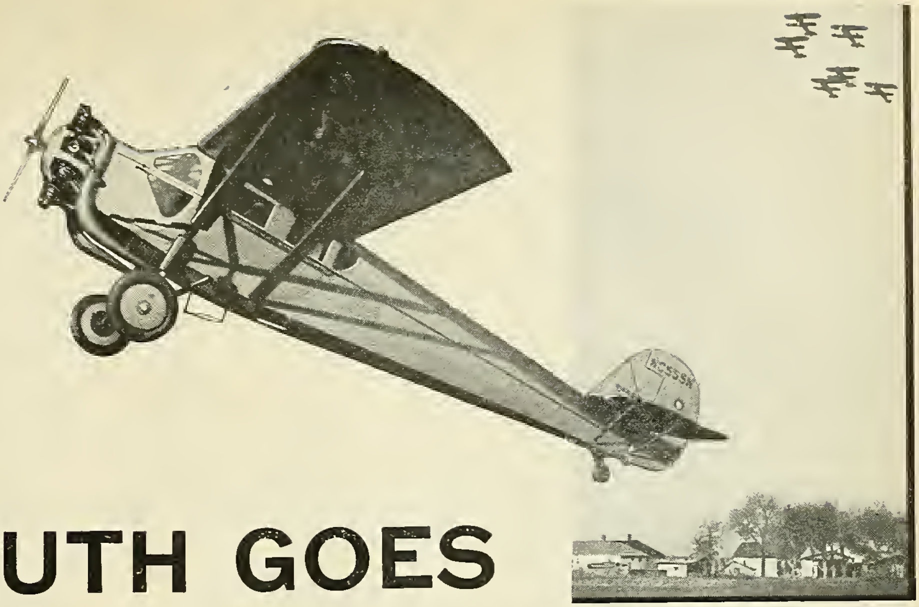

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LONGITUDINAL STABILITY of Monoplanes

DR. MAX M. MUNK

As suggested by F. R. Shanley, Aeronautics Branch, Department of Commerce

● The method for the computation of an airplane's longitudinal stability, as described in an article of the author in the October 1933 issue of the AERO DIGEST, can be further refined. Such refinement is needed for the investigation of low-wing monoplanes, because with them the center of gravity is usually situated considerably above the wing chord. The arguments made use of in the above article implied that the aerodynamic center is a fixed point, that it is located at 25% of the mean effective chord, and that the c. g. is likewise located at the wing chord. Experiments appear to indicate that through the ordinary flight range the a. c. lies actually near the wing chord at a fixed station and is probably located a little ahead of the 25% point; near 22% or 23%. A careful analysis of the existing wing section data with reference to the position of the a. c. should be undertaken. With low-wing monoplanes, the position of the c. g. above the wing chord explains certain flight characteristics not found with high-wing monoplanes.

Stability Characteristics

Generally speaking, low-wing monoplanes in ordinary flight have about the same stability characteristics as other airplanes. During a dive, however, when low-wing monoplanes are nosed up, a stability characteristic develops which is peculiar to this type. Once the nose is in the act of moving up, it becomes difficult or even impossible to stop the upward motion. The airplane over-controls and has a tendency to stall or go into a loop. At low angles of attack the airplane is longitudinally stable; at high angles it becomes unstable.

This instability will take place even when the longitudinal distance between the a. c. and the c. g. is sufficiently large to provide ample stability for a high-wing airplane. It appears desirable, therefore, to refine the a. c. method for the present problem, taking into consideration the vertical position of the c. g. with respect to the mean effective chord.

In the above-mentioned article, it was shown that the stable moment is equal to the product of the resultant additional air force multiplied by the longitudinal distance between the c. g. and the a. c., when the latter lies behind the c. g. This is only correct as long as the latter distance represents the magnitude of the lever arm of said force relative to the c. g. With a high c. g. location, this distance is not usually equal to that lever arm, but the lever arm is generally smaller and may even assume the direction of instability.

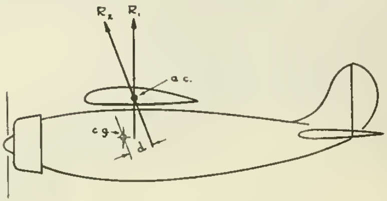

FIGURE 1. HIGH WING MONOPLANE

The Chord Component

We now have also to give attention to the longitudinal or chord component of the resultant air force. All resultant air forces pass through and intersect at the a. c., or approximately so, and this a. c. seems to be vertically located at or near the mean effective wing chord. The chord component of any resultant air force may therefore be considered as acting approximately along the mean effective wing chord, the vertical location of which is practically the same as that of the mean aerodynamic chord of the wing alone. At small angles of attack this chord component is small, so that the line of action of the resultant air force is nearly at right angles to the chord.

Effect of Increased Angle

As the attack angle is increased, however, the chord component becomes negative and rapidly gets larger, which causes the resultant line of action to be tilted forward. Hence, if the c. g. is located at a considerable distance above the chord, it can lie closer to the line of action than its longitudinal distance from the c. g. would indicate. The lever arm becomes smaller than the center distance as the angle of attack is increased.

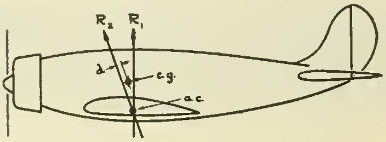

FIGURE 2. LOW WING MONOPLANE

The accompanying sketches illustrate this point. In both figures, R_1 represents the resultant force at a relatively low angle of attack, while R_2 represents the same force at a high angle of attack. Figure 1 shows a high-wing airplane, with the c. g. below the wing. At higher angles of attack, the distance (d) from the c. g. to the line of action of the resultant air force becomes even larger than the center distance. The airplane becomes more stable as its angle of attack is increased, which is, of course, a desirable feature. Figure 2 shows a low-wing monoplane. It is easily seen that as the line of resultant action tilts forward it thereby approaches the c. g. and the lever arm becomes smaller. This diminishes the longitudinal stability. In the case illustrated, R_2 actually passes ahead of the c. g., giving rise to an unstable (stalling) moment.

In practical cases, the maximum forward tilt of the line of the resultant air force is about ¼, that is, for each foot of the c. g. elevation above the wing chord, the stable lever arm of the resultant air force would be reduced by about three inches, at the most.

Two Useful Rules

The following rules result from these simple arguments and are useful as a guide for estimating the effect of the vertical elevation of the c. g. on longitudinal stability:

(1) The vertical position of the c. g. does not seriously influence the longitudinal stability of a high-wing airplane; that is, one in which the mean aerodynamic chord lies above the c. g.

(2) In a low-wing airplane (c. g. above m. a. c.) an upward shift of the c. g. decreases the stability at high angles of attack unless it is offset by a forward shift equal to approximately one quarter of the vertical shift.

In applying rule 2, the location of the c. g. should be determined along lines parallel to and perpendicular to the basic wing chord. The use of the tangent chord line gives slightly more conservative results.

The above rules are especially useful when applied to airplanes for which the most rearward permissible c. g. location has previously been determined from stability tests, as such tests indirectly account for the effects of fuselage lift and drag, downwash, and other indeterminable factors. The method does not, however, give any indication of the effect of the vertical c. g. position on spinning characteristics.

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Terminal Velocity

●

HOWELL W. MILLER

● The value of the terminal velocity of an airplane and the time and distance required to attain it, is a subject of increasing importance to aeronautical engineers. The time required and distance covered by an airplane in a vertical power-off dive is a matter which has been comparatively untouched by designers. A simple method of determining these functions of airplane performance is given below, and an example is used to outline the steps to be followed.

An airplane in diving attitude and with the propeller assumed out of action, is subjected to two major vertical forces. (1) a drag force, D., acting at the center of gravity and (2) a downward force, W., also acting at the center of gravity. The latter force (which is the weight of the aircraft) produces the acceleration to the diving airplane. The value of this acceleration decreases as the airplane approaches its terminal velocity.

Figure 1 shows these vertical forces acting in a dive. The resultant of W-D let us refer to as F. The terminal velocity is reached when D = W.

A series of calculations on a typical airplane with the following characteristics would be:

Gross weight (W)	2,600 pounds
Engine power (HP)	420 horsepower
High speed (V_{max})	180 m.p.h.
Propeller efficiency (η)	80%

Neglecting induced drag (which at high speed and above is of minor importance when compared with the total drag) we have the following total drag:

$$D = \frac{\rho a}{\rho o} \times \frac{375 \times HP \times \eta}{V_{max}}$$

where $\rho a/\rho o$ is the relative density. Substituting in the above equation:

$$D = \frac{1 \times 375 \times 420 \times .8}{180} = 700$$

pounds drag at 180 miles per hour.

As stated above, the terminal velocity will be attained when D = W, and since D is proportional to V^2, we have:

$$D/D_t = V^2/V_t^2$$

And substituting we have:

$$\frac{700}{2600} = \frac{180^2}{V_t^2} \quad \text{or}$$

$$V_t = \sqrt{\frac{180^2 \times 2600}{700}} = 347.5 \text{ m.p.h.}$$

In other words, this airplane will accelerate until a speed of 347.5 m.p.h. has been reached, after which the velocity will remain practically constant. This statement is not strictly correct, because an airplane in diving attitude passes through air which becomes more and more dense. However, the values are close enough for all practical calculations. To be more exact an average value of relative density ($\rho a/\rho o$) could be used, say the value at an altitude midway between the absolute ceiling of the airplane and sea level.

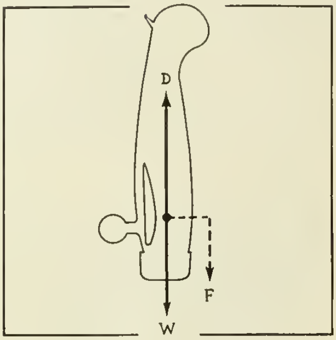

Figure 1. Vertical forces

To simplify the following calculations, we may determine a coefficient "K":

$$D = KV^2 \text{ or } K = D/V_t^2$$

In our example,

$$K = 2600/347.5^2 = .02155$$

or $D = .02155\ V^2$ m.p.h. .... (1)

From elementary mechanics:

$F = ma$ .... (2)

$F = (W\text{-}D) = Wa/g$ .... (3)

$a = F/m = (W\text{-}D)g/W$ .... (4)

$t = v/a$ .... (5)

where

F = force, pounds
m = W/g
W = weight of airplane, pounds
a = acceleration, feet/seconds^2
g = 32.2 feet/seconds/seconds
D = drag of airplane, pounds
t = time in seconds
v = velocity in feet/seconds

For the example, the following table is to be used. In column (a) is listed arbitrary increments of speed in miles per hour up to the terminal velocity of the airplane. Column (b) is determined by substituting in equation (1) above. Column (c) is the speed in ft./sec., obtained by multiplying the values of column (a) by 1.467. Column (d) is the net force acting on the airplane and is equal to (W-D) or the gross weight of the airplane minus column (b). Column (e) is the acceleration of the airplane and is obtained by substituting in equation (4). Column (f) is the time required to reach the speed corresponding to column (a) and is obtained by substitution in equation (5).

(a) Speed m.p.h.	(b) D .02155 V^2 m.p.h.	(c) V ft./sec.	(d) Net force F = (W-D)	(e) acceleration a = (W-D) g/W	(f) Time (secs.) t = v/a
50	54	73.4	2546	31.6	2.32
100	216	146.7	2386	29.6	4.96
150	485	220.0	2115	26.2	8.40
200	863	293.5	1737	21.5	13.65
250	1347	366.5	1253	15.5	23.6
300	1940	440.4	660	8.2	53.7
347.5	2600	509.0	0	0	∝

Figure 2 is a time-speed curve of this airplane. To determine the distance covered in the dive at the end of any time increment it is necessary to integrate the area under the speed time curve. The "distance covered" curve is also plotted on figure 2.

It is interesting to note that for the particular airplane presented, the absolute ceiling is 18,000 feet. Neglecting the radius of pull-out at the bottom of the dive, it would require only 53.4 seconds and the velocity attained is only 438 ft./sec. (299 m.p.h.). If we allowed 2000 feet altitude for pulling out of the dive and started the dive at the absolute ceiling of the airplane, the airplane would reach a speed of 435 ft./sec. and the time of descent would be 48.7 seconds.

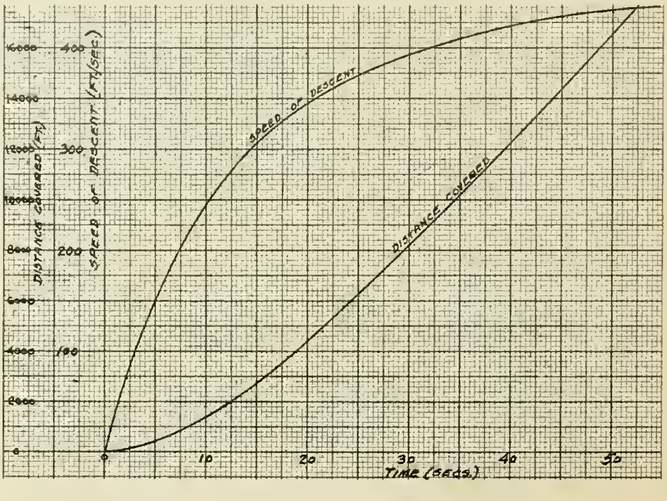

Figure 2. Time-speed curve for typical airplane

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Some Technical Notes on Lindbergh's Lockheed

● At Colonel Lindbergh's suggestion his seaplane was weighed upon returning from his recent survey, in order to determine accurately the loading under the conditions of his non-stop crossing of the South Atlantic Ocean. The figures obtained are of interest from a technical standpoint and with his permission the following data has been prepared for AERO DIGEST by the Edo Aircraft Corp.

Weight empty, including equipment	4589 lbs.
Col. & Mrs. Lindbergh's weight	280 lbs.
Miscellaneous baggage	27 lbs.
Oil (20 gal. at 7.5 lbs.)	150 lbs.
Gasoline (435 gal. at 6.1 lbs.)	2653 lbs.
Gross weight at time of take-off	7699 lbs.

The true weight empty of the plane (including standard instruments, radio, battery, starter, etc.) was estimated to be 4289 lbs. after making allowance for approximately 300 lbs. of special instruments and equipment carried on the South Atlantic crossing. This gives a useful load of 3410 lbs., or 44.3%.

The total gasoline capacity of the plane was actually 440 gallons, consisting of 320 gallons in the floats and 120 gallons in the wing tanks, but an allowance of 5 gallons was made to allow for consumption during warming up prior to the take-off.

The wing area of the Lockheed Sirius is 265 sq. ft. The Wright Cyclone SR-1820-F2 direct drive engine is rated 710 h.p. at 1900 r.p.m. It is fitted with a metal Hamilton Standard controllable pitch propeller with a diameter of 10 ft., having blade settings ranging from 18.5° to 22.5°. The all-metal floats are a pair of standard Edo model 6075 fitted with special fuel tanks and normally rated for a maximum gross weight of 6400 lbs. at 90% reserve buoyancy. Each float has a total submerged displacement of 6075 lbs. From the above weights the following figures are obtained:

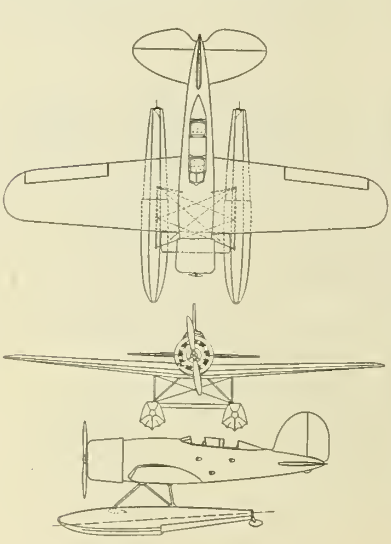
Wing loading	29.0 pounds per square foot
Power loading	10.85 pounds per horsepower
Reserve displacement of floats	58%

At the time of take-off the wind velocity was estimated to be 10 m.p.h.; surface of the water, slightly choppy; air temperature, 18° centigrade.

The sea level top speed of the ship was approximately 185 m.p.h. and its normal cruising speed 150 m.p.h. at 1700 r.p.m. During the 30,000-mile flight Col. Lindbergh cruised at an average of only 1425 r.m.p., which gave him a speed of 103 knots (approximately 118 miles) per hour. At this speed the gasoline consumption of the engine was 25 gallons per hour. During the trans-Atlantic crossing the r.p.m. was held between 1350 to 1390 and the fuel consumption dropped to approximately 21 gallons per hour.

It will be seen from the above that the actual range of the ship in still air was in the order of 2100 miles, at a cruising speed of 118 miles per hour. When Col. Lindbergh picked up the South American coast after 15 hours and 55 minutes flying he still carried fuel in his tanks sufficient for approximately 5 hours' flight.

When the Lockheed was placed on exhibition in the American Museum of Natural History in New York City last month, it had some 41,000 miles of seaplane flying to its credit in addition to several trans-continental flights with its land gear, and although a new and latest type engine and propeller had been installed prior to its recent Atlantic circuit, the original plane and floats remained unchanged. From point of service they had seen a total of some 5½ months exposure to tropical heat and Arctic cold, swinging to moorings and generally on salt water. It will be remembered that the ship was partially submerged in the waters of the Yangste River, in 1931, while preparing for a flight over the flooded areas of China. On that occasion the plane had been lowered by cables from the British Aircraft Carrier *Hermes* in the same manner that its Air Force seaplanes are handled. It was found, however, that the quick-release mechanism regularly employed in connection with the hoist could not be adapted to the Lockheed without extensive alterations and due to the urgency of the famine relief mission, the risk of operating without it was deliberately taken. The engine was left running for the purpose of maintaining control and as the seaplane was lowered into the swift running water it swung broadside to the current. As it drifted downstream there was no opportunity to get sufficient slack to unhook the cables from the top side of the wing, and in the absence of any release mechanism the ship was pulled slowly over as the end of the cable was reached.



Lindbergh's Lockheed seaplane

The radio set, donated to the museum along with the rest of the equipment carried by the Lindberghs on their recent flight, weighs less than 70 pounds and uses less current than the smallest house bulb, yet it has been heard a quarter of the way around the world. Before its installation in the Lindbergh plane, the set had never been off the Pan American airlines for which it was developed, privately, by the company's engineers. The set was originally developed more than five years ago. A minimum service range of 600 miles is required to keep planes in the air in constant communication with at least three of the System's stations.

Mrs. Lindbergh, who with her husband received her schooling in radio from engineers of the Pan American Airways System, and who holds a third-class commercial radio operator's license, operated the set under conditions varying from Arctic blizzards to equatorial thunder storms. With this set she communicated with commercial stations on Long Island and New England when the plane was at the Cape Verde Islands. Over Greenland she talked with ease to stations in the United States. But perhaps her greatest distances were achieved immediately after the take-off from Bathurst, Gambia, British West Africa; within three minutes after the plane rose from the waters of the African coast on December 6, en route across the South Atlantic, she was in communication with the Pan American Airways communications base at Miami, Florida, approximately 5,100 miles across the sea. And thereafter through the night her signals came in clear and strong to Pan American stations between Miami and Buenos Aires, Argentina.

The little set, a stock model of the standard radio equipment designed and built at the Pan American shops in Miami, is the standard radio installation on Pan American's fleet of 150 international airliners in service between North and South America and in Alaska and China. It was installed in the Lindbergh plane prior to the couple's flight to China in 1931. It survived the rigors of that trip, including submersion when the plane turned over (as mentioned previously) and has functioned with unbroken regularity ever since.

Powered by a small dynamotor operated from a 12-volt storage battery, the radio had a power output of 20 watts.

(*Continued on page* 49)

The Kinner 300 Horsepower C-7 Engine

● The new 5-cylinder 300 h. p. engine produced by the Kinner Airplane & Motor Corp., Ltd., has the same bore as used on the C-5 engine for the past three years. The cylinder head is also similar, except that the rocker box is cast integral with the head, thus eliminating oil leakage around the bottom of the rocker box and permitting better finning on the exhaust port side.

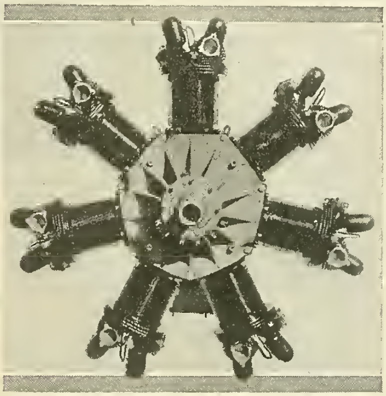
The finning on the cylinder head has been increased where hot spots were located, resulting in more uniform cylinder head temperature and decreased distortion of head due to unequal expansion. The cylinder barrel is similar in dimensions to the one used on the C-5 engine, but the finning has been rearranged to give better cooling. This combination reduces the head temperature approximately 20° under similar operating conditions.

The rocker arm has a roller bearing axle, also a roller at the valve stem end. Grease shot through a zerk fitting passes through the rocker arm main bearing to the top of the push rod. It is expected that with this design of head and valve mechanism, inspection will be necessary only at approximately 50 to 100 hours. This will be known after tests of longer duration have been made.

The crankcase is in two main sections, the power section and the manifold and accessory section. The front section, made of two castings, has bosses to carry collector ring where a nose type collector ring is used. It also has provision for a built-in valve mechanism for controllable pitch propeller. It is proposed to use an impeller at engine speed on the C-7 engine, but provision has been made so that this engine may be supercharged. Accessory drives do not run through the supercharger chamber, all accessories being driven from an extension of the crankshaft.

The following drives are provided for: two magnetos, electric starter, electric generator, fuel pump, vacuum pump, air pressure pump, two gun synchronizers and tachometer. Each accessory has its own mounting pad. Provision has also been made to use a 6" barrel at a later date; this, together with supercharging, would make it possible for the engine to deliver approximately 420 h.p. at 1800 r.p.m. and 500 h. p. at 2200 r.p.m.

A static oil pressure system is used. Oil is introduced into the rear of the crankshaft under pressure and lubricates all crankshaft and accessory drive bearings. Oil drains back from critical points where possibility of leakage exists, while oil from the pressure relief valve is recirculated back into the engine. Pistons and piston pins are lubricated by splash, and the main section of the crankcase provided with a sump, having a large easily-removed oil strainer. The scavenger pump is of the three gear type, having two inlets and two outlets, scavenging oil from the sump and from the accessory drive section. Oil from the scavenger pump is circulated around the impeller section of the crankcase which cools the oil and warms up the intake fuel air mixture; from that compartment oil is returned to the oil tank. Provision is made on the pressure oil pump for a Cuno oil filter.


Propeller end of the Kinner C-7

The induction system has an 11" diameter impeller wheel with straight vanes driven at crankshaft speed. A Stromberg NA-R9A carburetor is used. In the supercharged model of this engine the impeller is replaced by the supercharger impeller of the General Electric type driven through a train of gears with a clutch protecting the gears from injury when the engine is accelerated and decelerated.

A two-piece crankshaft is used with a one-piece master rod having a bearing of the steel-backed copper lead type. The crankshaft is carried on three anti-friction type bearings. Link rods are of a design similar to those previously used in the C-5 engine.

The longer stroke (6" as compared with 5.75" in the C-5 type) results in more power and greater rotating weight, the latter resulting in smoother engine operation.

When checking valve timing, the two rear sections are removable without disturbing any accessory or the supercharger or impeller section, as these sections can be removed as units.

The starter drive is directly in line with the crankshaft and direct electric or other direct cranking starters can be used without any back gearing. The starter jaw is carried on an anti-friction bearing.

All electric accessories are mounted at or above center line of engine and all other accessories such as fuel pump, carburetor and oil pumps are located below the center line. This arrangement tends toward reduction of fire hazard.

Provision is made for two separate gun synchronizer drives at rear and top of engine, readily accessible and so located that connections to guns and triggers are easily accomplished.

Specifications

Rated horsepower	300
Rated r.p.m.	1800
Bore	5.625 inches
Stroke	6 inches
Displacement	1044 cubic inches
Compression ratio	5.25 to 1
Weight dry	575 pounds
Overall diameter	51.312 inches
Mounting bolt circle	20 inches
Total length	44.125 inches

• Recent Aeronautical Patents •

The following patents of interest to readers of Aero Digest recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

Cargo handling apparatus for aircraft and like. Manuel Castro, Canton, Ohio. (1,935,077)

Intake system for aircraft engines. Alexander H. King, West Hartford, Conn., assignor to Pratt & Whitney Aircraft Co. (1,935,186)

Equipment for moored airships. Otto Krell, Berlin, Germany. (1,935,271)

Gun mounting for aircraft. Barnes N. Wallis, Weybridge, England, assignor to Vickers-Armstrong, Ltd., Westminster, England. (1,935,491)

Synchronized throttle control and control for reversible or adjustable-pitch propellers. Daniel A. Dickey, Dayton, Ohio. (1,935,620)

Water ballasting apparatus for aircraft. Thomas G. W. Settle, Lieutenant Commander, U. S. Navy. (1,935,672)

Airplane instrument. John O. Gette, Jr., Yonkers, N. Y., assignor to Pioneer Instrument Co. (1,935,740)

Aircraft control means. Ralph H. Upson, Red Bank, N. J. (1,935,824)

Apparatus for constructing large hangars. John H. Pomeroy, Bellevue, Wash. (1,935,990)

Stinson Reliant for 1934

● The new 1934 Stinson Reliant, four-passenger cabin plane with the 225 h.p. Lycoming R-6680-6 engine is designed to provide reliable cross-country transportation for the business man and commercial operator, with airliner safety and at operating costs comparable to motor car travel.

In designing this ship Stinson engineers sought to secure reliability, stability, quick take-off and short landing ability, sedan comforts, wide vision, high cruising speed, quietness, adequate heating and ventilation and low cost maintenance and operation.

The Lycoming engine mounted on rubber vibration dampeners, with Scintilla magnetos, Stromberg carburetor and Eclipse electric starter with 12-volt aircraft storage battery, was again selected because it has proven its reliability by millions of miles of safe flying.

Speed arresters between the ailerons and the wing roots permit the pilot to choose gliding angles ranging from the unusually long 10-1 descent to a steep descent, at decreased speed, enabling clearance of high obstacles at the edge of airports and allowing the ship to come to a complete stop in a short distance. The speed arresters maintain lift during descent contrary to the function of "air brakes" which merely offer increased resistance without providing the lift necessary to adequate control when landing at slow speeds.

Other innovations incorporated in the 1934 Reliant are full low-pressure Air Wheels with water-proof disc type hydraulic brakes.

Flight instruments are mounted on the indirectly lighted instrument panel, making them easier to read in flight, and are assured double life by installation of rubber vibration dampeners.

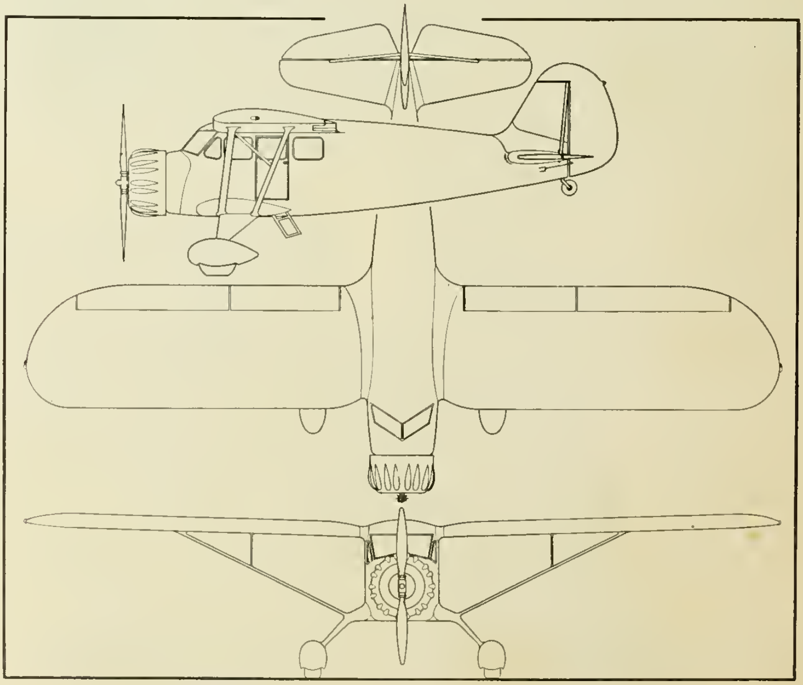
Wings, of Clark "Y" section, have been "gulled," the span decreased two feet and the chord increased to 80 inches. Streamlining is used to a greater degree than ever before with full NACA speed cowling on the engine, pants or mud guards as optional equipment on the wheels, and wing butts, fin, stabilizer and strut ends all smoothly filleted in metal. These later items are now standard equipment.

A new V windshield offers less resistance and provides wider vision and a sun visor and rear vision mirror are installed. Safety glass is used throughout. An arm rest is provided; the dual control column is adjustable fore and aft and one control wheel is quickly removable. Both pilot seats are also adjustable.

Noise has been reduced and the heating and ventilating system permits passengers to regulate the amount of fresh, warm or cool air entering the cabin. All passenger windows may be raised and lowered with automobile-type regulators. The instrument panel and metal window moulding are finished in colored lacquers to harmonize with side walls and divan-type seats in optional colors, seat backs and map pockets. A carpeted floor, satin finished hardware, rear cabin side lights, ash receivers, glove box, vanity closure and assist cords are provided.

The baggage compartment, of ample size to hold bags and golf clubs may be reached from both inside and outside of the cabin. When the outer door of the baggage compartment is opened a light is automatically switched on.

In external appearance the ship is smartly styled and striped and decorated



Outlines of the 1934 Stinson Reliant powered with the Lycoming engine in 12-coat, high-lustre finish. For thorough and rapid inspection, as well as for lower maintenance costs, the chrome molybdenum fuselage, I-beam steel compression struts, chrome nickel steel drag rods, metal wing ribs and ailerons as well as the control system, the brake mechanism, shock absorbers and landing gear may be easily reached through inspection doors and zipper-fastening openings.

Specifications

Wing span	41 feet
Length	26 feet 10 inches
Height	8 feet 5 inches
Power loading	14.3 lbs. per sq. ft.
Wing loading	13.7 lbs. per h.p.

Weights (pounds)

Pilot	170
Three passengers	510
Baggage	65
Weight empty	2150
Gross weight	3225

Areas (square feet)

Wings (including ailerons)	235
Ailerons	28.2
Speed arresters (not standard)	21.5
Stabilizer	23.7
Elevators	17.1
Fin	10.95
Rudder	13.25

Performances

High speed	138 miles per hour
Cruising speed	120 miles per hour
Landing run (without arresters)	250 feet
Rate of climb	675 feet per minute
Service ceiling	14,500 feet

ULTIMATE MILITARY AIRCRAFT

(*Continued from page* 21)

Such is the case with an Air Force.

To go from the theoretical to the practical side of the Air Force problem the question arises as to what the possibilities are in the way of fighter or pursuit airplanes in the United States. In military aircraft of the pursuit type, speeds are rapidly approaching 300 miles per hour; in the commercial types capable of being adapted to pursuit use, this speed has already been exceeded by a considerable margin. Under these circumstances it is possible and probable that the pursuit airplane will reach or exceed 300 miles per hour within the next two years.

When an airplane enters the high-speed class its landing speed naturally increases. High landing speeds are objectionable in military aircraft due to the nature of the fields it may be necessary to employ in emergency. However, since the advent of brakes and flaps this objection has been, to a large extent, overcome.

Contrary to the belief of some of our engineers that it is not practical to place flaps on single-seater monoplane pursuit airplanes due to their short wing span and the fact that such a large part of the trailing edge of the wings is taken up by the ailerons, commercial airplanes, adaptable to pursuit use, are appearing with a very efficient flap, occupying the space available on the wing and extending under the fuselage as well.

What form the fighter airplane will take, i. e., whether it will be single-engine, monoplace or multi-engine, multiplace, depends upon future developments. If the requisite speed and rate of climb can be attained by the multi-engine, multiplace fighter the advantages to be gained by its adoption are as follows: Greater offensive armament, including aircraft bomb load and machine guns; greater operating range; ability to furnish protection to bombardment and its adaptability to other uses, such as bombardment, observation and attack in order that the Air Force may remain balanced in the event of changes in the tactical situation.

The idea of the bombing of aircraft in flight is not new, but until recently it has not received serious thought, nor has there been a concerted effort to develop it.

A formation of bombardment airplanes, in order to maintain strong defensive fire power and take advantage of mutual fire support, must keep a close formation.

The problem presented to the fighter consists of two parts: first, the breaking up or deploying of the defensive formation either by casualties or extension of distances between airplanes and, secondly, the destruction of the individual airplanes. Bombing offers a solution to this problem.

For the purpose of illustration it is assumed that a fighter squadron of 18 airplanes is attacking a bombardment squadron of 10 airplanes. A bombardment squadron in javelin formation presents a horizontal projection of slightly less than 200,000 square feet.

Assuming that the fighter formation is carrying five 17-pound bombs equipped with combination time and instantaneous impact fuses in each plane or a total of 90 bombs, and that the effective area of each bomb has a radius of 25 feet; then the total effective area of all the bombs, providing they are evenly distributed, would equal approximately the total area of the bombardment formation.

The bombs, however, could not be evenly distributed, nor would it be advantageous to attempt to do so. On the other hand, if the fighters assumed a formation of 2 fighters over each bombardment airplane, 10 bombs would be concentrated in the vicinity of each of 9 of the 10 bombardment airplanes in the formation, thus greatly increasing the probability of hits.

The fighter formation would be flown at an altitude sufficiently above that of the bombardment formation to place it out of the effective range of the defensive fire of the bombardment.

LINDBERGH'S LOCKHEED

(*Continued from page* 46)

This system of power supply permitted both transmission and receiving, either aloft or on the surface. It likewise made possible the use of the radio for emergencies, for seventy-two hours of regular hourly scheduled communication.

All six frequencies of the set were used, the four short waves to communicate with stations on the western side of the Atlantic and the two long wave frequencies to communicate with the continental European stations and with steamships. Mrs. Lindbergh often changed frequencies to reach different sides of the oceans or meet peculiar climatic conditions. The plane was equipped with trailing antenna which varied from 30 feet to 125 feet in length.

Another radio feature operated with great precision by Mrs. Lindbergh was the radio direction finder with which Pan American has done considerable research work. Instead of the fixed loops as used on the international airliners, on the Lindbergh plane the loop was wound around the inside of the fuselage. By pointing the plane at the signals from any transmitting station, until the minimum intensity was reached, the exact direction from which the signals were coming could be determined.

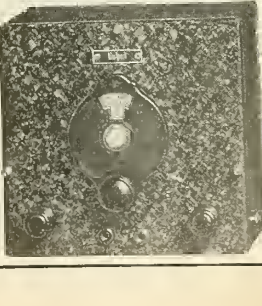
Now YOU, Too, Can RIDE the BEAM

The New WESTPORT JUNIOR Model AR40 brings in the weather, range beacons and entertainment programs. It measures less than 7x7x4½ inches, and weighs only 4½ pounds. And the price is only $99.50.

A real thrill awaits you the first time you twist the dial to get the weather, beam or entertainment broadcast. Simple to operate and sure in performance, the new JUNIOR is a fitting companion to the standard WESTPORT AIRCRAFT RADIO Model AR62. Investigate!

Pacific Airmotive Corp., Ltd.

United Airport, Burbank, Calif.
Oakland Airport, Oakland, Calif.



. NEW EQUIPMENT and METHODS .

Spring-Tester Uses Photoelectric Relay

• THE MATERIEL Division, U. S. Army Air Corps, Wright Field, Dayton, Ohio, uses an old punch press as a fatigue testing machine for shock absorber springs. The equipment operates 24 hours a day, a small counter indicating the number of times the spring is compressed. In the past, the difficulty was that the spring might break during the night, and since the machine would continue to operate, record an incorrect number of compressions on the counter.

The problem was solved by so installing a General Electric photoelectric relay, that the light beam passes beneath the bottom of the plunger when the plunger is in its lowest position. In this arrangement, the spring intercepts the light beam and prevents it from falling upon the phototube under ordinary circumstances. When the spring breaks, however, it collapses and the beam passes over it to the phototube which actuates a relay to stop operation of the machine.

Cold-Weather Engine Starting Unit

• THE AVIATION Department of the Standard Oil Company of New Jersey, in cooperation with the Navy Bureau of Aeronautics, has studied the problem of cold weather starting of high-duty aircraft engines and has developed a starting unit comprising a cylinder of Hopane gas, a specially designed injection pistol and hose and a bayonet connection for permanent attachment to the airplane.

The basic theory is the priming of the engine with a gaseous fuel which remains in gaseous form even at temperatures where vaporization of liquid fuel, and complete mixing with the air in the cylinders is impracticable. The result is the Hopane priming system which feeds all cylinders directly with the explosive mixture, which can then be ignited by the normal means.

Hopane, the gas used, is manufactured by the Hope Construction and Refining Co., Pittsburgh, Pa., and is a pure petroleum product, non-corrosive and of even greater anti-knock value than octane itself. Using it, the ratio of air to fuel for an explosive mixture may be varied over a wider range than is practicable with most gasolines, and inasmuch as the priming fuel is already in gaseous form, it is unnecessary to combine it with air through the carburetor.

In starting an engine with this unit, the Hopane gas may be forced into the intake manifold by the pistol injector, the engine turned over by hand to insure entrance of the fuel into the cylinders, and the normal means of starting employed. Once the engine has fired, it may be kept running until it is firing evenly on the regular gasoline supply by injecting further small amounts of Hopane. The pistol injector, with its trigger valve, is so arranged that so long as the trigger is held depressed the gas will flow into the manifold.

The process of intermittent priming to keep the engine running after it has fired, has long been described by mechanics as "goosing," and this term has been accepted for the new starting unit. In addition to the portable airport unit, the starting system will be made available in a small self-containing unit for the equipment of the plane itself, and in a direct coupled unit which will connect the Hopane cylinder direct to the engine, using the valve in the cylinder top in place of the pistol injector. The complete airport unit includes a specially designed hand truck for carrying the cylinder of gas, a regulator valve for reducing pressure from the Hopane cylinder for injection into the engine and the pistol, hose and bayonet connections.

Cold weather engine starting unit

Cyclops Aerial Camera

• A NEW high-grade, low-cost, aerial camera known as the Cyclops, has been made available by Fairchild Aerial Camera Corp., its distributor. Featuring light weight and simple operation, this camera is suitable for owner-pilots, flying service operators and others desiring a less expensive aerial camera than has been available heretofore.

The camera opens up a new source of income for commercial operators and a new field for those interested in photography, being easy to handle and simple to operate. It has a negative size of 3¾ x 5¾ inches, found best for oblique aerial photographs, and it can make obliques and close-range photographs on the ground, including time exposures. It weighs less than 15 pounds and is fitted with two full sized grips. The maximum section, exclusive of handles, is 6 x 8 inches and the overal length is approximately 15 inches.

An F4.5 24 cm (9½ in.) Tessar type lens, specially selected for aerial photography, is fitted on a focusing mount equipped with an infinity locking device. The focal length of the Cyclops is 9½ inches; its focal range, 8 feet to infinity. The rear element of the lens is readily accessible for inspection and cleaning. A filter which, because of its location, cannot be blown off or become dusty, can be placed over the lens. The variable tension focal plane shutter ranges in speed from 1/10 to 1/1000 seconds. Provision is made for film pack, cut film or plates.

Improved Hypressure Cleaning Unit

• FROM THE standpoint of potential cost savings, airport executives and officials of air transport companies and testing fields will be interested in the new fully-automatic Model D Hypressure Jenny, a high-powered machine for all-purpose cleaning, paint-stripping or sterilizing, manufactured by the Homestead Valve Mfg. Co., Coraopolis, Pa.

The new model is electric-motor driven, operating on lighting current, and arranged for instant starting from a push-button switch. The fuel-oil burner used for heat generation is of the pressure-atomizing type, as used for household heating purposes. Ignition is by an automatic electric spark.

One of the important mechanical improvements is the use of rotary solution water and fuel oil pumps, direct-connected to the ¼ h.p. motor, eliminating gears, belts, chains and check valves.

Cyclops, the new aerial camera

Airport Radio Receiver

• THE RCA VICTOR Model AVR-1 airport receiver was developed specifically for the following usages at airports:

a. To permit reception of weather reports as broadcast by airways radio stations of the Department of Commerce.

b. As an entertainment receiver.

c. To permit reception of airport-aircraft communication, to ascertain the movement of aircraft and also to learn from transport aircraft radio reports the weather encountered aloft.

Pilots and aviation executives may use the AVR-1 as a "home" radio for reception of entertainment programs. With the additional low and high frequency bands available, one may listen to airways weather reports—pilots' reports as they fly their routes—police radio broadcasts, and foreign radio broadcasts on the higher frequencies.

The AVR-1 airport receiver is a self-contained, eight-tube, superheterodyne receiver, with a maximum power output of 12 watts, and an undistorted power output of 6 watts. It incorporates a frequency range of 150 to 18,000 kilocycles (2,000 to 16.6 meters) in five bands as follows:

Type of Reception	*Switch Position*	*Frequency Range (Kilocycles)*	*Wave Length Range (Meters)*
Airways weather reports	X	150-410	2,000-732
Entertainment	A	540-1,500	555-200
Aviation communication, Police reports, foreign, and amateurs.	B	1,500-3,900	200-75
	C	3,900-10,000	75-30
	D	8,000-18,000	37.5-16.6

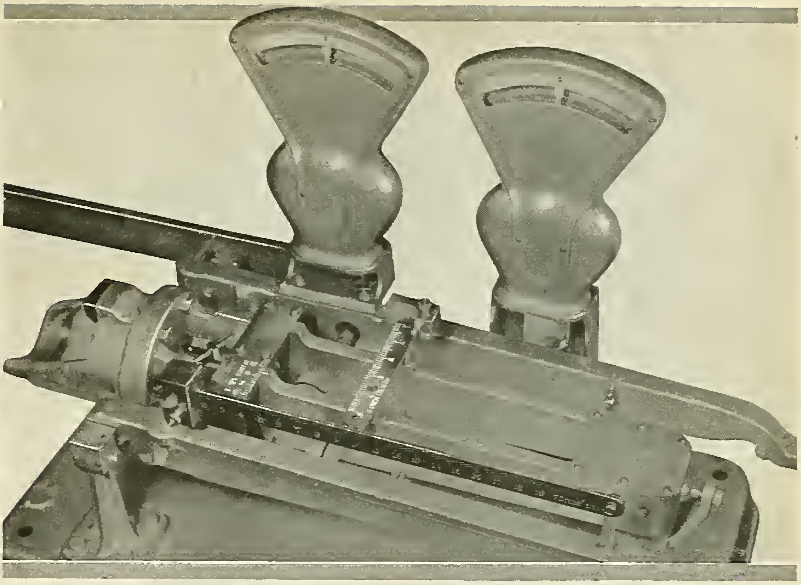
On its illuminated open-face airplane type dial the five frequency bands are clearly indicated to correspond with the switching mechanism, and with each of the five bands calibrated to show all frequencies. It uses a double-ended needle pointer which operates at a ratio of 55 to 1, through 180°.

Extreme sensitivity is obtained with a minimum of background noise, attained through the especially designed circuits and complete shielding. Sensitivity on the high frequency bands is increased by the use of an additional RF stage in the high frequency bands, assuring maximum signal noise ratio and consequent distant reception.

An intermediate frequency of 445 KC assures maximum performance with interference-free operation. Automatic volume control is especially designed for short-wave reception with manual level control.

The AVR-1 operates on 110 or 220 volts, 60 cycle single phase AC power supply. The receiver comes in a table model cabinet of striped mahogany veneer incorporating a full size dynamic loudspeaker with an 8-inch cone. The cabinet is about 21½ inches high, 15 inches wide and 11 inches deep. The construction is designed to withstand long and strenuous service under all climatic conditions.

RCA Victor AVR-1 radio receiver



Toledo propeller blade balancing gage

Propeller Blade Balancing Gage

• A PROBLEM in the specification and manufacture of inserted propeller blades at service stations has been the establishment and maintenance of characteristics of balance so desirable for interchangeability. The preparation and use of masters of fixed moment against which the blades must be balanced in the course of manufacture and the methods used in making and recording blades of given characteristics of balance are processes which leave considerable to be desired from the viewpoints of speed, convenience, flexibility and the production of definite quantitative results.

The Toledo Airplane Propeller Blade Balancing Auto-Gage model 9581, permits the complete elimination of masters by quickly indicating, in definite amounts, longitudinal moment and out of balance on the minor axes of the blade. The device is graduated to indicate moment in widely spaced 1/10" pound divisions.

By using the device, out of balance or moment may be determined on either of the minor axes and on the longitudinal axis, simultaneously. This permits turning the blade within the adapting fixture to definitely locate the exact point where material must be removed to bring a blade to balance on its minor axis. Longitudinal balance is indicated on a long graduated bar and on a scale-chart; the condition of balance on the minor axes, on shorter graduated bars and on another chart.

Adapters for propellers of different size may be obtained with the machine. In addition, counterbalance weights for application at the right end of the device (supplied by the manufacturer of the equipment) are stamped with their weight in pounds. As they have an effective torque arm of 30", they are of known moment and if desired, can be made variable in weight by using an assembly of unit rings on a rod.

A feature of the gage, the product of the Toledo Scale Co., Toledo, O., is its stability and capacity to produce uniform results, through care in design and manufacture to eliminate or compensate for the effects of changed conditions. For instance, adequate means are provided to adjust the machine to zero balance indication when changing from one size of blade to another. Further, since most blades are made from aluminum alloys, the main balance members of the machine are aluminum castings, so that blades and balance members have similar coefficients of expansion. Thus, changes in the device due to variations in temperature are entirely eliminated.

THE AIR SERVICES

Schiff Trophy Awarded

PRESIDENT ROOSEVELT presented the Herbert Schiff Memorial Trophy to First Lieutenant David L. Cloud, Jr., of the Marine Corps at a ceremony at the White House.

Lieut. Cloud received the trophy as present commander of Observation Plane Squadron VO-7-M, which for the past fiscal year completed the most successful year of flying hours without accident to material or personnel. The name of the squadron has been inscribed on the trophy which will continue in custody of VO-7-M during the present fiscal year while a miniature replica will go to the squadron for permanent retention.

Coast Guard Base Additions Planned

A SEAPLANE hangar and other equipment will be added to the new coast guard air base to be established in Galveston, Tex. The Southwestern Construction Co., Houston, submitted the lowest bid for the construction of the hangar and equipment at the field. The base will entail an outlay of $290,000, divided into new barracks, radio building and other facilities.

Maxwell Field to Be Improved

THE BUILDING program planned for Maxwell Field, Montgomery, Ala., army air base was scheduled to get under way January 1, 1934. Approximately $1,603,075 is expected to be spent and Capt. M. M. McFadden, construction quartermaster is anxious to see the work well under way before he leaves for his new post at the Aberdeen Proving Grounds in Maryland where another construction and improvement project is planned. Capt. John R. Tighe has been assigned to succeed Capt. McFadden at Maxwell Field.

Army Will Buy 100 Planes

A HUNDRED airplanes will be purchased by the Army immediately as part of a replacement and expansion program, the money coming from $7,500,000 allotted by Public Works to the Air Corps.

The purchase will include 46 bombers, 40 attack and 24 pursuit planes as well as radio equipment, machine guns, spare parts and engines. With the addition of the new bombers, it is felt the Army will have one of the most efficient bombing forces in the world.

NAVY FLIERS SET NEW DISTANCE RECORD

SQUADRON VP-10, under command of Lieut. Comdr. Knefler McGinnis, flew from San Francisco to Honolulu, non-stop and in formation exceeding its own world's record for such a flight. The same squadron previously flew from Norfolk to Coco Solo, Canal Zone, a distance of 2,059 miles, but the Pacific flight entailed a 2,400-mile flight. The six planes in the squadron, Consolidated Flying Boats powered by two Wright Cyclone engines, negotiated the course in 24 hours, 45 minutes, averaging between 90 and 100 miles an hour. Since leaving Norfolk, the planes flew some 7750 miles.

Army Flier Gets Burr Prize

FOR HIS accomplishments in the technical field of aerial photography on National Geographic Society expeditions, Capt. Albert W. Stevens of the Air Corps was awarded the Franklin L. Burr prize of $1,000.

The prize was given particularly for the achievement of obtaining from an altitude of 26,000 feet during an eclipse of the sun, the first aerial photographs showing the moon's shadow on the earth. Another important achievement by Capt. Stevens, mentioned in the award, was the taking from a high altitude of the first photographs showing laterally the curvature of the earth.

Two-place Curtiss YO-40A Army observation plane with Wright Cyclone engine

Navy Will Fill Plane Quota

AN EXTENSIVE construction program will bring the Naval aviation force to the full 1,000 plane quota fixed by Congress during the 1935 fiscal year, according to Rear Admiral Ernest J. King, chief of the Bureau of Aeronautics, who said that the budget now before Congress proposes expenditures of $6,131,000 for aircraft construction during 1935, a figure which is slightly less than appropriated last year.

The appropriations would be sufficient to bring the air strength up to capacity unless prices of materials rose unexpectedly high, Admiral King said.

Admiral King also recommended that henceforth provision should be made for full aircraft complement of all new ships authorized by Congress, thus preventing a drain of the 1,000 limit, which naval authorities consider insufficient and which would be reduced by placing the aircraft aboard new ships.

Harrill Commands Anacostia

COMMAND OF the Naval Air Station at Anacostia has been taken over by Lieut. Comdr. W. K. Harrill, who succeeded Capt. Warren G. Child, recently relieved of duty there. Comdr. Harrill, who has been serving as executive officer of the station for 18 months, is a native of Knoxville, Tenn., and holds the Navy Cross for battle service during the World War.

One of his first acts was to open the base to visitors on Saturdays and Sundays, saying that many persons have called on the grounds during these days, but were not allowed to inspect the facilities. His policy of inaugurating open house is prompted by a desire to establish a closer relationship between the service and the public.

New Aircraft Delivered

THIRTEEN AIRPLANES, seven of them accepted following final inspection of inspectors and pilots of the Materiel Division, Wright Field, Dayton, were flown to their various destinations recently.

From Dayton a Bellanca was flown to France Field, Panama Canal Zone; a Douglas 0-38F to the Maryland National Guard; a Douglas C-29 to Bolling Field, Washington, D. C.; and one each Douglas 0-38E to the National Guard units in Ohio, Michigan, Indiana, Pennsylvania.

The following airplanes were flown from Fairfield Air Depot, Patterson Field, Ohio: a BT-2B and a P-6D to Langley Field, Va.; a P-12C and two O-19B's to Maxwell Field, Ala., and an 0-25 to Kelly Field, Texas.

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NEWS OF THE SCHOOLS

Clubs Formed by School

THE FIRST of a series of aero clubs sponsored by the Rising Sun Aircraft School of Philadelphia, Pa., has been formed and flying headquarters established at the Boulevard Airport. According to Francis Wipf, president, the club members, comprised solely of mechanical students from the school, will receive flight training under Warren G. Nichols.

Plans are under way for a second club, and according to Fred Vilsmeier, president of the school, the students have almost unanimously adopted the idea.

Penn School Reports Activity

ACTIVITIES AT the Penn School of Aviation, Pittsburgh, Pa., have continued in full swing despite a stretch of inclement weather. At present 45 students are taking flight instruction, 27 of them at the Allegheny County Airport Division and 18 at the Pittsburgh-Butler Division. In addition the ground school division has an enrollment of 25.

Three transport pilot graduates were employed recently by Pennsylvania Airlines as co-pilots, according to F. R. Crawford, Managing Director of the school. In addition, Clyde Paddack, a former graduate, was promoted to the position of division manager at the Pittsburgh terminal of the airline.

Ryan Students Fly Cross-Country

STUDENTS OF the transport classes at the Ryan School of Aeronautics, San Diego, Calif., recently navigated their Great Lakes planes in formation to Ensenada, Mex.: Phoenix, Ariz.; Blythe, Calif., and San Francisco. The majority of these trips include overnight stops at their destinations with numerous landings in between for familiarization with various types of airports.

Safair Moves Headquarters

AFTER a year of operations at Valley Stream, L. I., Safair, Inc., has leased Hangar B at Roosevelt Field, Mineola, N. Y., where it will continue to operate a flying school, charter service, and aerial photography division. In addition the company has enlarged its facilities to include sales, service and storage.

The flying school holds an approved certificate for all grades of licenses and is associated with New York University where the ground school is conducted under the direction of Dr. Roland Spaulding. For flight training the school uses Curtiss Fledglings, Birds, Robins, Cessnas and Curtiss-Wright Sedans.

Personnel includes O. P. Hebert, president; S. A. Reiss, John Phillips, M. J. von der Heyde, Donald Gutch and William Jarrett.

SCHOOLS GET AMATEUR PILOT COURSE REGULATIONS

TO PROVIDE for the newly created amateur pilot license, the Aeronautics Branch has amended the Air Commerce Regulations pertaining to schools. A new unit has been announced known as the amateur pilots' flying or ground school and special provision is made for minimum flying instruction of 25 hours or a similar number of hours in ground school work.

Boeing Graduates Class

COMMENCEMENT exercises for the fifteenth graduation class of the Boeing School of Aeronautics, were held at the Oakland, Calif,, airport with Comdr. F. L. Warden of Moffat Field, Sunnyvale, Calif., as the guest speaker. Comdr. Warden described the difference between lighter-than-aircraft and heavier-than-aircraft and told of the problems encountered in navigating the U. S. S. *Macon.* His talk, which had the effect of creating considerable respect for airships as a means of defense, included many statistics on the performance and construction of the lighter-than-aircraft.

School Teaches Aviation

THE TEANECK, N. J., high school, which has had an aviation club in operation for several years, has accepted a complete aviation course as part of the regular curricula work. Classes in the theory of aerodynamics, aircraft structure, meteorology and celestial and terrestial navigation as well as field work and actual flight training began with the February semester.

The school is purchasing a training type airplane and has outlined a course of instruction which is most comprehensive and complete. Instruction will be under the direction of A. G. Norwood.

Personnel at School Increased

THE APPOINTMENT of two more men at the Ryan School of Aeronautics, San Diego, Calif., has brought the total of new employees in the engineering and maintenance departments there in the past three months to seven. Chester Bratch and Paul Birbeck are those who have been added to the welding and sheet metal departments.

Edward Morrow and Mel Thompson were recently added to the staff of instructors, the former teaching welding, while the latter is serving as assistant to the instructor in charge of the school woodworking and fabric departments.

Parks Courses Popular

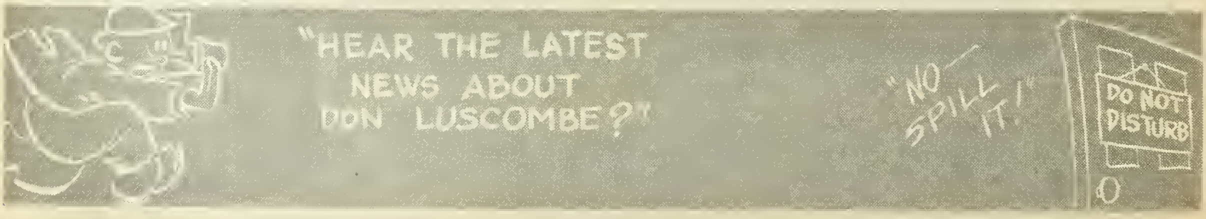
ANNOUNCEMENT OF expansion and improvement of Parks Air College courses in aviation has brought enthusiastic response to the E. St. Louis, Ill. headquarters of the school. Shortly after the new two-year course in Aeronautical Engineering was announced, 16 applications were received and scores of inquiries for additional information came into the school's offices.

An analysis of more than 200 inquiries indicates that the course is popular because practical training is involved. In addition to the usual engineering subjects taught, the new course includes practical training on sheet metal work, welding, rib, beam, wing and control surface construction, covering and finishing, rigging and final assembly, engines, instruments and propellers. The student also receives 20 hours of flight instruction.

School's Advisory Board Named

THE NEW advisory board of the United Schools of Aeronautics, which recently took over the operations of the Curtiss-Wright School of Aeronautics at Valley Stream, Long Island, N. Y., consists of Daniel Carter Beard, J. S. Allard, Brigadier General M. F. Davis, Capt. Clements McMullen, Lieut. Comdr. Paul W. Hains, Lieut. Comdr. C. A. Nicholson, Bruce Johnson and Earl R. Southee.

The school is offering a practical as well as a theoretical course, with emphasis on the former. The school's outstanding course is the Practical Aeronautical Engineering course.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PRIVATE FLYING and CLUB NEWS

New Record Made at Miami

FOUR DAYS of aerial competition came to an end on January 14 when the Sixth All-American Air Races at Miami, Fla., were concluded. More than 300 planes attended the event which was featured by a number of closed course races, speed dashes, aerobatics and precision flying by Army and Marine fliers. One new world's record was established and another almost equalled.

As a prelude to the races 59 planes competed in the Orlando-Miami Air Derby, won by Larry P. Sharpless of Philadelphia who received the Col. Henry L. Doherty Trophy and $500. The fastest race of the first day went to Doug Davis who won the 15-mile race by flying his Travel Air 130 miles an hour. Jimmy Wedell supplied the speed on the second day, attaining 234 miles an hour while the highlight of the races came on the third day when Jack Wright broke the world's speed record for light cabin planes (with passenger), flying 167.482 miles an hour over a 100-kilometer course in his Warner-powered Monocoupe. Other outstanding speed dashes were made by Howard Hughes who flew his special Boeing in a free-for-all race at 185.707 miles an hour and by Lee Miles, who flew at 194.511 miles an hour, close to the world's record of 195.818 miles an hour.

The military units at the field were the Sixth Pursuit Group of 36 planes from Langley Field, and ten P-12's flown by the Marines from Quantico. The army group flew Keystone Bombers, Boeing P-12's and Curtiss P-6-E's.

Because of the unusual interest evidenced by the general public during the first three days, a fourth day of events was scheduled.

Milk Pickets Balked by Planes

AN INTERESTING sidelight to the recent milk strike in Illinois is furnished in the story of how some Chicago dairies evaded the milk blockade by resorting to the use of airplanes.

Nearly 2,000 gallons of milk were flown from Kankakee, where they were picked up from a non-striking organization by a Wasp-powered Flamingo belonging to Comet Air Express of Chicago and a Stinson Junior of Koerner Brothers of Kankakee. Landed in Chicago at the municipal airport, a police guard was furnished to escort the shipment to the dairies in the city. Shipments were made over a period of two days, operations conducted from small, rough fields and code employed to notify the pilot whether the coast was clear of pickets.

A third ship, a Cessna flown by J. R. Bailey was forced down while carrying a load of milk. The ship was surrounded, the milk dumped and the pilot held captive for a few hours.

WOMEN WIN HONORS IN AIR MEET EVENT

AIRMEN IN San Mateo, Calif., toasted their women fliers who captured the honors in the final day of the Pacific International Air Pageant. Gladys O'Donnell won the 25-mile closed course feature race, followed by Henrietta Lantz and Leo Bowman.

Mrs. Lindbergh Gets Honor Cross

THE CROSS OF HONOR of the United States Flag Association was sent to Mrs. Charles A. Lindbergh by air express from Washington, D. C.

Connie Mack Takes First Ride

CONNIE MACK, that shrewd, old, even-tempered patriach of the Philadelphia Athletics, took his first airplane ride as one of the highlights in the celebration of his 71st birthday. The famous baseball pilot made his aerial voyage over the environs of Philadelphia.

Women Form Auxiliary Unit

A WOMEN'S auxiliary of the St. Joseph Valley Aviation Club, South Bend, Ind., organization embracing aviation activities of Northern Indiana and Southern Michigan, has been formed with Mrs. Charles Clemens as president. Members include wives of pilots, women fliers and a number of prospective aviatrixes.

15-Mile Stratosphere Hop Planned

THE LARGEST balloon ever constructed for a stratosphere flight, 3,000,000 cubic feet, is planned by the National Geographic Society and the Army Air Corps for a 15-mile ascension into the stratosphere by Capt. Albert W. Stevens and Major William Kepner. Scientific information on cosmic rays, air movements, the usual stratosphere phenomena will be sought and Capt. Stevens will attempt to take an infra-red photograph of the curvature of the earth's surface. The first of two flights is scheduled for June.

Capt. Stevens who recently received the Burr prize for his photographic work, served as observer on a number of Army balloon ascensions.

Maj. Kepner, the pilot, is a veteran of the war. He won the National and International balloon races in 1928 and served on the dirigible *Los Angeles.*

Says Wales Has Air Mileage Record

THE FIRST of two articles concerning the flying exploits of the Prince of Wales by E. T. Woodhall indicate that the former's enthusiasm for flying amounts almost to a passion.

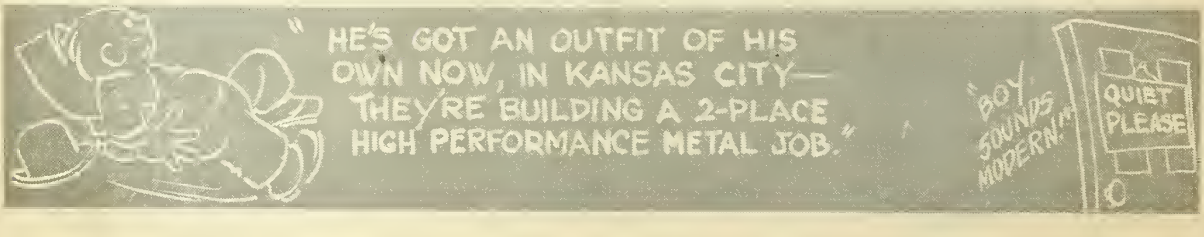
The Prince, states Woodhall, is the world's most widely traveled royal flier. He finds his planes invaluable as a means of making necessary public appearances and fulfilling social obligations, but in addition he has a keen desire for the advancement of the science of aviation.

Woodhall stated that he has learned from good authority that the Prince is seriously considering a transatlantic journey which would take him to Canada, landing at Montreal and continuing to his cattle ranch at Alberta.

Air Club Chooses Officers

H. K. COFFEY has been elected president of the Aero Club of Oregon and will serve with Dr. Raymond R. Staub, organization vice-president; Major Howard C. French, technical vice-president and M. F. Wright, secretary-treasurer.

Two committees were appointed; one to encourage the training of a military air unit in Oregon and the other to work in the interests of aviation in all parts of the state. In addition, the club is planning a state-wide membership drive.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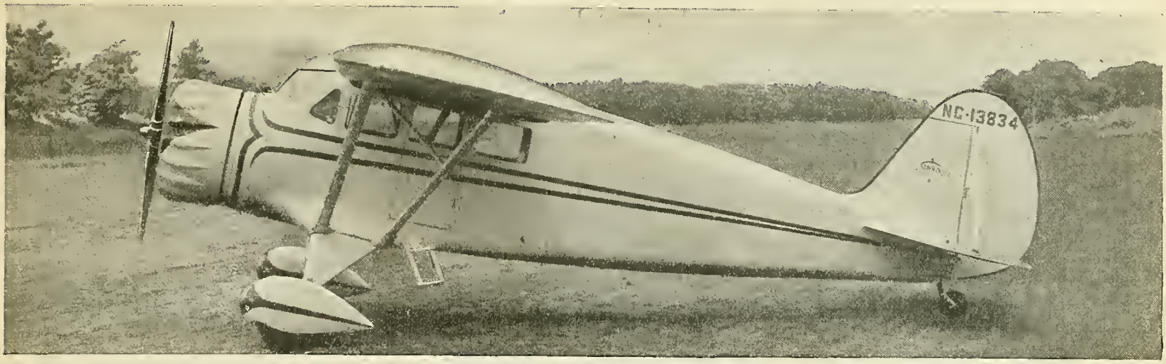

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Outstanding value was responsible for the fact that the 1933 Stinson Reliant outsold *ALL MAKES* of two, four, and six-passenger cabin planes *COMBINED* since its introduction in May. Never before was such decided preference shown for any make of plane.

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With more Stinson Reliants flying in 1933 than any make of four-passenger cabin plane, not a single person was injured and only one Reliant was damaged, in a landing due to heavy fog. This is a tribute to Reliant Flyers and is definite proof of safety.

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By flying more than 60 million miles on single engine and tri-motored planes in the United States, Alaska, South and Central America, Europe, the Philippines and other countries, the Lycoming Transport engine has been proven *MORE RELIABLE* than any motor of its power class.

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AT THE AIRPORTS

Many New Airport Projects Begun

IMPETUS TO airport construction and improvement by the availability of Federal funds is seen in a summary of a report issued by the Aeronautics Branch, which as of January 12, 1934, listed 563 such projects of which 310 were new airports and 251 represented improvements to existing fields.

While no report is available on the amounts being spent in each instance, AERO DIGEST's correspondents in the field have advised us of thirty-three cities and two states which are sharing in the drive and to which close to a million dollars has been allotted for airport work.

The Aeronautics Branch summary indicates that Minnesota, with 68 projects under way leads the other states. Montana has 49 sites at which airport work is being completed, including 33 new fields and improvements to 16 existing sites.

Seaplane Bases Sought

IN A MOVEMENT to obtain better landing facilities for seaplanes of all types, the Aeronautical Chamber of Commerce has taken steps to aid key cities of the country to get a share of public works funds from the government for seaplane terminals and has appointed a committee to carry out this purpose.

Headed by Charles L. Lawrance, the new committee includes Amelia Earhart, Eugene L. Vidal, Richard F. Hoyt, George B. Post and Leighton W. Rogers. It was pointed out that a small part of the $10,000,000 set aside from public works funds for the improvement and construction of airports would provide ramps with turntables for the use of seaplanes in many cities.

United Airport Traffic Gains

WITH A total of 126,672 persons flying into and out of the field during 1933, United Airport at Los Angeles again registered its claim as the nation's fourth-ranking air terminal.

Airline traffic scored a 19 per cent increase over 1932 with a total of 29,181 passengers. During that time, the daily average number of transport travelers increased from 65 to 80 with scheduled arrivals and departures on December 31 numbering 22.

Transport planes, in and out, numbered 8,489, a gain of 861 planes. The number of private flights advanced from 7,012 to 9,542 with plane occupants increasing from 12,232 to 16,364. Decreases, however, were noted in the number of student flights, transient visitors and sightseeing and charter flights.

AIRPORT TOTAL GROWS 71 IN YEAR

THERE WERE 2,188 airports and landing fields in the United States on January 1, an increase of 71 since January of last year. The fields listed included 563 municipal, 652 commercial, 265 Department of Commerce intermediate, 550 auxiliary, 55 Army, 13 Navy and 85 miscellaneous Government, private and state airports. California led, having a total of 211.

Trans-Atlantic Base Purchased

THE WATERFRONT base on Port Washington, Long Island, N. Y., has been purchased by Pan American Airways for development as the New York port for its regular trans-Atlantic air service. The property includes ten acres, two large hangars and a ramp with sheltered anchorage in deep water.

Airport Named After Brittin

COL. L. H. BRITTIN, executive vice-president of Northwest Airways was honored by the Bismarck, N. D., city commission when the municipal airport there was named Brittin Field.

The honor was conferred on Col. Brittin, who, by reason of "his vision and foresight, discerned the need of and advantages of this section for scheduled air transportation embodying the transport of mail, passengers and express." Bismarck is on Northwest Airways route.

Taylor Cub Agency Awarded to Hall

HAROLD HALL has been granted the sales agency for the Taylor Cub for North and South Dakota and Montana. Hall operates from the Wold-Chamberlain Field, Minneapolis.

New Capital Port Asked in Bill

THE HOUSE Military Affairs Committee has received a bill introduced by Representative McSwain of South Carolina calling for the establishment of a suitable airport for the National Capital.

The bill calls for the Presidential appointment of a committee of three, one each from the District of Columbia, Virginia and Maryland, who would be authorized to acquire a site, equip and operate the airport and employ the necessary personnel. Should the committee decide to acquire Hoover Field, the bill provides for abandonment of the old Military Road and for transfer of whatever portion of the Experimental Farm of the Department of Agriculture may be necessary to make the new airport sufficiently large.

Aeronca Dealer Appointed

EDWARD F. BOOTH has been appointed local dealer for the Aeronca, manufactured by the Aeronautical Corporation of America, Cincinnati, and has taken hangar space at Love Field, Dallas, Tex., where he opened a sales agency and flying school. Booth is also local distributor for Waco planes.

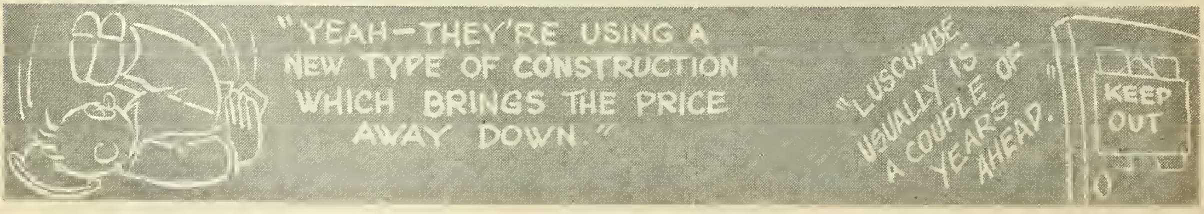
Field Lease Renewed

OZARK AIRWAYS, INC., has leased the municipal airport in Springfield, Mo., for another year, having been the operating company there during 1933. The repair shop at the port is at present busily engaged in rebuilding five planes.

Only recently the airport underwent extensive improvements, including the construction of gravel runways, installation of an underground drainage system and leveling of the surface.

Airport Subsidiary Formed

OPERATION OF the Rising Sun Airport has been taken over by Northeast Philadelphia Airport, Inc., a newly formed subsidiary of F. & S. Aircraft Corporation which will operate the field under the name Northeast Philadelphia Airport. It was erroneously reported last month in these columns that the name of the subsidiary corporation was Northwest Philadelphia Airport, Inc.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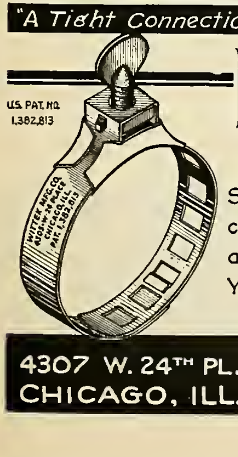

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. AIRLINES and AIR TRAVEL .

Group to Study Air Transport

ALL MATTERS pertaining to the air transport systems which may effect two or more departments in the government will be referred to a newly organized interdepartmental committee headed by Eugene L. Vidal, Director of Aeronautics. Primarily, the committee will endeavor to coordinate Federal policies with respect to air transportation in the United States.

Such topics as new lighted and radio-equipped airways and new passenger lines will be under the new committee while studies will be undertaken to coordinate the various transportation phases for the greatest benefit to all users of the system.

Other committeemen are W. W. Howes, Second Assistant Postmaster General, for the Post Office Department; and Maj. Gen. B. D. Foulois, chief of the Army Air Corps for the War Department.

Airline Increases Schedules

THE ADDITION OF a night passenger service between Cleveland and Washington, via Akron and Pittsburgh, has increased Pennsylvania Airlines schedules over the route to ten.

The northbound flight leaves Washington at 10 p. m. and reaches Cleveland at 1.35 a. m., while the southbound flight leaves Cleveland at 1.00 a. m. and arrives in Washington at 4.10 a. m. Passengers, mail and express are carried on both trips in Ford tri-motors, manned by a pilot and co-pilot.

Mail Contract Awarded

THE AIR MAIL contract for carrying the mails between New Orleans and Pilottown has been awarded to Tropical Airways of New Orleans, La.

Let on a bid of $48 a trip, the contract is for the fiscal year ending June 30, 1934.

Air Service Expanded

A DAILY round-trip passenger-express schedule was recently inaugurated between Seattle and Spokane by United Air Lines.

The new service provides departure from Spokane at 8.00 a. m. with arrival in Seattle at 10.30 a. m. The return trip starts from Seattle at 2.00 p. m. and reaches Spokane at 4.10 p. m. Four-passenger Boeing P. & W. Hornet-powered 40-B's are flown.

Coffeyville, Kan., became a flag stop on the company's route from Chicago to Kansas City, Fort Worth and other southwest points. William Berentz, manager of the airport, is serving as agent for the airline.

34,775 PASSENGERS FLEW IN NOVEMBER

SCHEDULED AIR transport lines operating in the United States carried 34,775 passengers in November, according to reports received by the Aeronautics Branch of the Department of Commerce from 23 of the 24 companies operating during the month. The lines flew 3,705,851 miles, carried 145,889 pounds of express and flew 12,248,345 passenger miles.

Short Line Finds Business Good

CHESAPEAKE AIR FERRIES, which recently started airline service between Baltimore and Easton, Md., has enjoyed a business increase. November showed a 100 per cent rise over October, while December also showed favorable returns.

Many women have used the air route to get to the shopping centers of Baltimore, while business men have found the service invaluable in their work.

Since inauguration of the service, the Tred Avon airport in Easton has shown a steady increase in its operations.

Licon Extends Air Route

A NEEDED adjunct to the growing network of airlines emanating from the Newark Municipal Airport has been provided by Licon Airways, Inc., operators of the airline serving Roosevelt Field, New Haven and Bridgeport, by the extension of its line to the Newark field and to Floyd Bennett Field in New York.

Schedules have been arranged to connect with important schedules at Newark to and from various parts of the country.

N. A. A. Group Traffic Increases

CUMULATIVE FIGURES for the first eleven months' operations of Transcontinental & Western Air, Western Air Express and Eastern Air Transport, the three lines controlled by North American Aviation, Inc., an affiliate of General Motors Corporation, indicate that the one hundred thousand mark for revenue passengers was passed in November, 1933.

More than 100,900 passengers, an increase of 80 per cent over the figure attained during the first eleven months of 1932, were transported. Mail poundage through November amounted to 2,019,112 pounds, a decrease of three per cent from the same period of 1932, while express poundage increased 179 per cent to 364,892 pounds for the first eleven months. Planes flew 11,993,985 revenue miles, representing an increase of 25 per cent over the same period in 1932.

Build New Airway Route

THE NEW night airway between Kansas City and Tulsa, for which the Public Works Administration has allotted funds for lighting, will cut the distance about 101 miles and save the Post Office Department approximately $86,000 annually postal officials at Kansas City believe.

The present airway is via Wichita and Ponca City, but the new route will be direct to Tulsa.

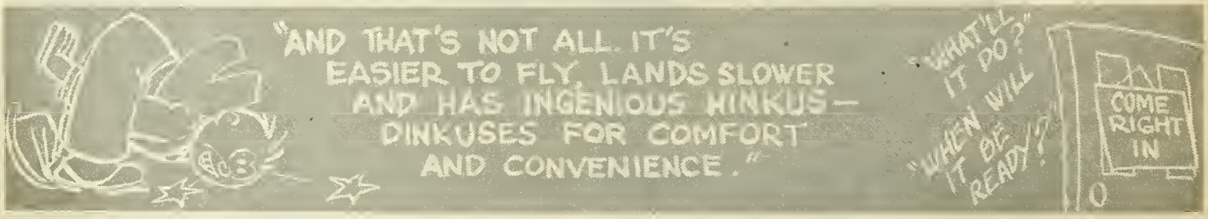
Airline Efficiency Bettered

CONSISTENT ADVANCES in the development of all-year airline efficiency were reported by Lester D. Seymour, president of American Airways, in reviewing operations by the company during the first ten months of 1933.

In that period, American Airways planes completed 10,009,876 of 10,811,608 scheduled miles to establish an operating ratio of 92.58 per cent. Continued development of all-weather flying aids, Mr. Seymour said, have made these records possible and give promise of even higher efficiency in the future.

November express tonnage set a record for the system when 38,592 pounds were carried representing an increase of almost 11 per cent over the poundage carried in October, the previous record month.

(*Continued on following page*)



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OCCUPATION 234

If WISHES WERE HORSEPOWERED . . . .

If dreams could be translated into deeds, many an ambitious young business man instead of facing stagnation in an office would be enthusiastically forging ahead in the great business of aviation. Soaring overhead every day, in constantly increasing numbers, are young men, alert and alive to the trend of the times, on their way to real achievement in an inspiring profession.

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(Continued from preceding page)

Code Committee Chosen

W. A. PATTERSON, vice-president of United Air Lines, Inc., was elected chairman of the Air Transport Code Authority at a meeting held at the offices of the Aeronautical Chamber of Commerce of America, and Leighton W. Rogers, executive vice-president of the Chamber, was chosen executive officer.

Other members of the Code Authority, which is administering the Code of Fair Competition for the air transport industry, include: E. R. Breech, president of North American Aviation, Inc.; H. S. Martin, president of Pennsylvania Airlines; L. D. Seymour, president of American Airways and J. T. Trippe, president of Pan American Airways. Temple Bowen, of Bowen Air Lines, and P. R. Braniff of Braniff Airways, are the other voting members of the Code Authority. Non-voting members include W. W. Howes, second assistant Postmaster General; E. E. Hughes, Deputy Administrator of the NRA and Eugene L. Vidal, Director of Aeronautics.

Relocate Airway Route

FURTHER RELOCATION of airway routes in various sections of the country to effect savings to the Government have been announced by the Aeronautics Branch of the Department of Commerce.

The lights on the Evansville-Lafayette, Ind., airway are to be changed to form an airway between Louisville, Ky., and Indianapolis, Ind., under an allottment of $19,500 from the Public Works Administration. By relocating the airway, which is 171 miles long, the Branch will save, in operation and maintenance costs, approximately $9,000 a year. The Post Office Department figures to save about $115,000 a year in the air mail service by reducing the airway to 110 miles.

American Airways Traffic Up

A SIZEABLE increase in passenger traffic and a new record for express poundage for a single month was reported by officials of American Airways.

For the sixth consecutive month, the company carried more than 10,000 passengers when 11,593 revenue travelers flew with the company during October. This figure represents an increase of more than 46 per cent over the comparable month a year ago when 7,922 passengers were transported. For the first ten months of the year, 100,900 paid passengers were carried.

Air express reached a peak of 34,802 pounds during October exceeding the best previous month by 729 pounds. For the first ten months of the year, air express poundage doubled over the same period a year ago.

ROUND-THE-WORLD BY AIR IN 57-DAY TOUR

A COMPLETE circle of the globe, made entirely by air except in one instance, is being offered as a regular scheduled air tour by Thomas Cook & Son-Wagon Lits, Inc. By air the traveler flies from San Francisco to Miami on domestic airlines; to Pernambuco by Pan American Airways; to Seville by *Graf Zeppelin;* to Marseilles and then on to Saigon by plane and from there by steamer via Hongkong to Vancouver, near the starting point. The entire trip takes 57 days.

City May Return as Airline Stop

RE-ESTABLISHMENT by Northwest Airways, Inc., of air mail service in La Crosse, is expected some time this year upon completion of the county airport project on French Island, Wis. The county's aviation venture was made possible by a federal grant of $31,938 to the Board of Supervisors for labor and the purchase of materials.

Air Express Shows Gain

REFLECTING A sharp upturn in business conditions throughout the nation, the Railway Express Agency registered an increase in air express shipping of more than 123 per cent for November over the same month of 1932, according to J. H. Butler, general manager, Public Relations Department.

In analyzing the gain, it is found that while interior points showed the greatest percentage of gain, the main terminal points on the REA system accounted for the largest proportional gains, with New York enjoying a 140 per cent increase in number of shipments. Denver showed the most startling gain with an increase of nearly 900 per cent over the previous year.

Airline Fleet Ordered

AT A COST in excess of $3,348,000, construction work is now going forward in five manufacturing plants for marine and land transport aircraft for Pan American Airways.

The newest planes ordered include 12 transports from Douglas Aircraft Co., Santa Monica and the Lockheed Aircraft Corp., of Burbank, California. Twelve other marine high-speed transports are now being manufactured for the company, six of them for trans-Atlantic service and six of a new type amphibion transport capable of exceptionally high speeds. Included in the companies building these planes are Fairchild Aviation Corp., and Sikorsky Aircraft Corp.

In addition to this equipment, Pan American has also advanced the construction of the marine airport at Miami, the eastern terminal of the international network of air routes.

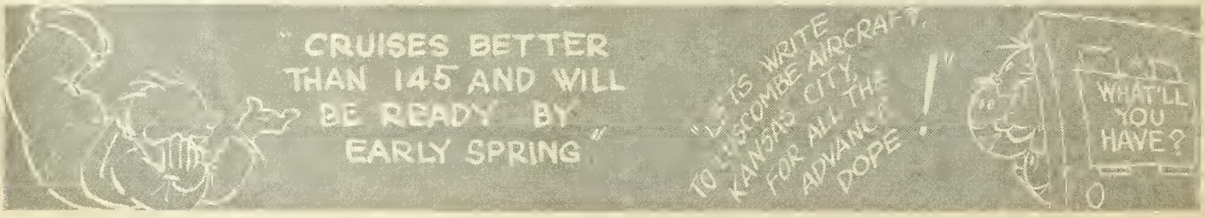
N. Y. Central Studies Air Route

SURVEYS LEADING to the possibility of an air transport service are now being made by the New York Central Lines, but it will be some time probably before the railroad reaches any conclusion as to whether it will engage in it or not. According to C. W. Y. Currie, publicity manager, if service is undertaken, its activities would be restricted to the territory now covered by the system.

The entrance of the railroads into the air transport picture is one of extreme importance. Some of these transport companies have been actively connected in the operation of an airline, particularly in the New England states where the Boston & Maine Railroad and Vermont Central operate Boston-Maine Airways as a subsidiary company between Boston, Portland, Waterville and Bangor. This airline company already has more than five months of steady operation behind it.

TWA Plane Makes Fast Flights

TWO NEW commercial aviation speed records were set by one of Transcontinental & Western Air's mail planes when a westbound ship flew from Kansas City to Los Angeles in 8 hours 29 minutes elapsed time. Two days later the same plane made the return trip in seven hours flat, maintaining an average speed of 212 miles an hour.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THE INDUSTRY IN GENERAL

Small Plane Plan Progressing

COOPERATION OF leading manufacturers of aircraft was assured the Department of Commerce in its proposal to develop a new, low-priced, quantity production airplane, when 22 manufacturers adopted a resolution supporting the plan of Eugene L. Vidal, Director of Aeronautics. Further impetus was provided by an allottment of $500,000 by the Public Works Administration for development work out of which it is hoped, will come the plane which will foster private flying in the United States.

As a result of the meeting, the manufacturers appointed two committees who will work out the preliminary details of a plan whereby the industry and the Government may work together in the development of the proposed plane. The committees will report back to the main group of manufacturers the results of their preliminary work on a comprehensive and practical plan for actually developing and producing the type of plane which Mr. Vidal believes is awaited by thousands of prospective buyers.

The first committee which will cooperate with the Government in working out the technical details and complete performance specifications of the new plane and its engine includes Ralph S. Damon, chairman; C. J. Brukner, president, Waco Aircraft Co.; B. D. DeWeese, general manager, Stinson Aircraft Corp.; R. H. Fleet, president, Consolidated Aircraft Corp.; and C. G. Taylor, president, Taylor Aircraft Co., Mr. Damon is president of the Curtiss-Wright Airplane Co.

The second committee will cooperate with the Government in determining the legal and economic practicability of organizing a corporation within the industry to undertake development and production of the plane. Its members include Sherman M. Fairchild, chairman; E. R. Breech, president, North American Aviation, Inc.; P. G. Johnson, president, United Aircraft & Transport Corp.; Thomas A. Morgan, president, Curtiss-Wright Corp., and Taylor Stanley, president, Aeronautical Corporation of America. Mr. Fairchild is president of Fairchild Aviation Corp.

BOEING PRODUCTION REACHES 1812 PLANES

A TOTAL of 1812 planes in 56 different types has been produced by the Boeing Airplane Co., Seattle, Wash., since its inception in 1916. The company's 1933 production included 60 Model 247 transports, Wasp-powered F4B-4 carrier fighters for the Navy; single-place pursuits for Brazil; a bomber for the Army Air Corps and the first of the new-type P-26A pursuits for the Army Air Corps, approximately 25 of which already have been flight-delivered.

Kellett Production Continues

PLANS OF the Kellett Autogiro Corp. for this year include continuation of the manufacture and production of the new model K-4 which recently was granted an A. T. C. by the Department of Commerce, as well as other new models which may be developed. At present, W. Wallace Kellett, president and R. H. Prewitt, research engineer, are in England studying recent autogiro developments of Juan de la Cierva.

In addition to the Giro manufacturing activities of the company, the Giro Sky Ads activities, which have increased during the past year, will be continued.

F. A. I. to Meet in U. S. in '34

THE FEDERATION Aeronautique Internationale, world governing body for aeronautic sport, has accepted an invitation to hold the 34th conference in the United States, marking the first time since its inception in 1905 that the annual conference was not held in an old world city.

Representatives from 34 countries are expected to come to Washington for the conference, bringing together the greatest international gathering of aeronautic experts in this country since the International Civil Aeronautics Conference of 1928.

The last conference of the Federation was held at Cairo, Egypt, from December 19 to 23, and it was at this gathering that it was decided to come to the United States for the next annual meeting.

Luscombe Will Market Own Plane

DON LUSCOMBE, who was vice-president and general manager of the Monocoupe Corp. for the past eight years, has resigned his position to enter the light aircraft field with an airplane produced by his own company at Kansas City, Mo.

The new enterprise, known as the Luscombe Airplane Co., will produce a two-place cabin job featuring a high cruising speed, metal monocoque fuselage and wing flaps. The plane, the first of which will be ready early this spring, is being built around the 90, 125 and 145-horsepower Warner engines.

Luscombe, who is remembered as being among the first in this country to introduce the small, low-priced cabin plane, will be associated with Ivan H. Driggs, formerly of Driggs Aircraft Corp., who is chief engineer and operations manager of the new company.

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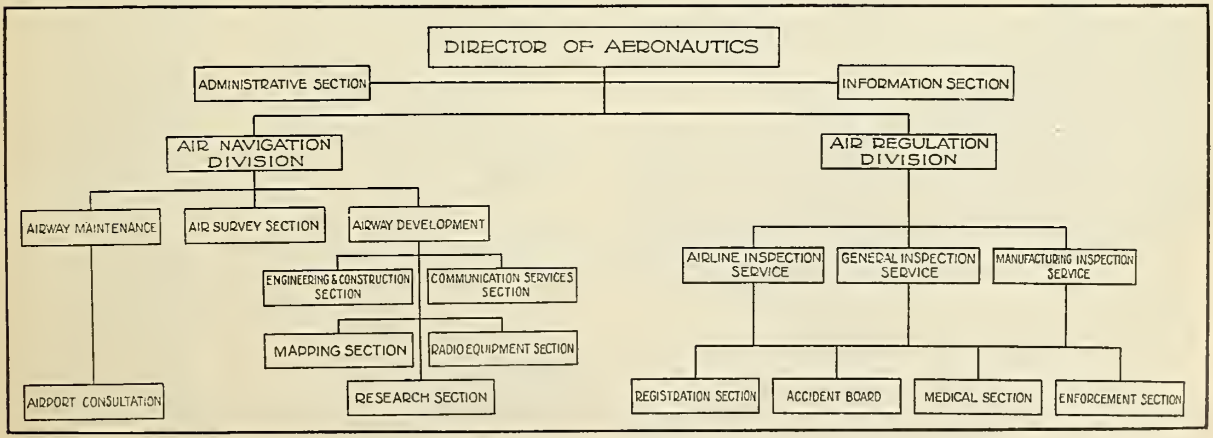

Organization chart of the Aeronautics Branch, United States Department of Commerce

(*Continued from preceding page*)

Boeing Delivers Pursuits

A NUMBER OF the new all-metal, low-wing P. & W. Wasp-powered P-26A pursuit planes being built by Boeing Airplane Co., Seattle, Wash., for the Army Air Corps were scheduled for delivery recently. The first was flown away from the factory early in December.

Work on the 15 additional Model 247 transport planes for the general market is progressing favorably and three will be delivered this month and the balance by the last of May.

New Aircraft Company Formed

PRODUCTION OF a small airplane will be undertaken by the newly formed Harper Aircraft Corp., in the former Argo factory building in Alliance, Ohio.

John Harper and J. R. Seidner have been experimenting with a two-place plane which they expect to place in production shortly.

Small Plane Production Planned

THE ARUP single-wing plane, invented by Dr. C. L. Snyder of South Bend, Ind., will be manufactured by a newly formed corporation known as the Arup Manufacturing Co. The company, capitalized at $200,000, will maintain a factory at South Bend where, it is reported, the Chamber of Commerce is assisting it in factory arrangements.

The plane, which has been successfully flown for some time, is powered by a 37-horsepower engine and is being made to sell for about $800, it is said. Deliveries are expected within three months after operations begin.

Officers are Dr. Snyder, president; O. H. Collmer, Jr., and F. A. Ruggles, vice-presidents; R. W. Goheen, treasurer and Dr. S. J. Vurpillat, secretary.

Used Ship Exchange Busy

ONE OF the newest departments at the Waco Aircraft Co., factory, Troy, Ohio, is the Used Ship Exchange, a department being maintained and operated in the interests of those who have used planes for sale.

The ships are listed and the information placed with every Waco dealer, distributor and interested party, a service which is provided without charge and which has resulted in the sale of 16 ships in a little more than two months.

Sales Manager Appointed

W. A. NUGENT has been appointed sales manager of the Independent Pneumatic Tool Co., Chicago, Ill., by Neil C. Hurley, president. Mr. Nugent has been with the company 19 years and during that time served as St. Louis Branch Manager, assistant to the president and in other similar capacities. He is in charge of all pneumatic and electric tool sales.

November Exports Reach $617,245

EXPORTS OF aeronautical equipment from this country to foreign markets during November reached a total of $617,245, a slight decrease from the $678,727 reported for the previous month.

Argentina was the largest purchaser, buying $309,809 worth of aircraft and $9,400 worth of accessories. Other large sales were made to Bolivia, which bought $54,000 worth of aircraft and almost $2,000 worth of equipment; to Russia, which spent $32,658 for engines and $31,395 for equipment, and to the Republic of Panama, whose purchases reached $61,412.

The largest importer of American parts and accessories was Netherland E. Indies, whose purchases came to $32,540.

(*Continued on following page*)

• Digest of Recent Events •

New Women's Endurance Record Made at Miami

THE WOMEN'S refueling endurance flight record of 8 days 4 hours and 5 minutes was broken by Mrs. Frances H. Marsalis and Miss Helen Richey, who flew their *Outdoor Girl* over Miami for 9 days 21 hours 43 minutes. The women flew a Curtiss Thrush monoplane powered by a Wright J-6 engine. Mrs. Marsalis was co-holder of the previous record, her flying partner in that venture being Louise Thaden. DEC. 30.

Italian Pilot Sets Altitude Mark

THE ALTITUDE record for planes of the third category was broken by Giovanni Zappetta, who flew a Nuvoli N5 powered by a 75-horsepower Pobjoy engine to 24,288 feet. The former record was also held by an Italian who reached 22,559 feet in his plane. Planes of the third category are listed as multi-seaters weighing less than 280 kg.

Byrd Flies Over Ice Pack

AERIAL INVESTIGATION of unchartered spaces of the Antarctic was accomplished in a series of flights by Rear Admiral Byrd, who endeavored to find trace of land beyond the continental front of the Pacific quadrant of Antarctica.

From the Wright-powered Curtiss Condor, the Admiral was unable to find land and on the basis of his flights was convinced that some 200,000 sq. mi. of unknown area lying within the aerial tracks can be wiped off Antarctic maps and desginated Pacific Ocean. JAN. 3.

Speed Mark Set By French Flier

A NEW land-plane speed record for a 1,000-kilometer course was set by M. Massotte, French pilot, who flew the course in 2 hours 47 minutes 31 seconds, averaging 358.2 kilometers an hour. The former record, 347.8 was held by the German flier, Hunkel. JAN. 7.

Pilot Named to Russian Post

THE POSITION as assistant military attache for air at the American embassy in Moscow has been conferred upon Lieut. T. D. White, who will be the first American Army representative assigned to the Russian post for 17 years. Lieut. White was stationed at Bolling Field. JAN. 15.

French Plane Sets Distance Mark

THE FOUR-MOTORED seaplane *Southern Cross* flew from Berre, France to St. Louis, Senegal, to set a non-stop seaplane flight record of 2,666 miles and then, with a crew of five, made an uneventful flight of 2,010 miles across the Southern Atlantic in 18 hours 17 minutes. The plane, under the command of Capt. Germain Bonnot, of the French Navy, is designed to operate in the trans-Atlantic air mail service soon to be inaugurated by the Consolidated French Aviation Co. JAN. 1.

Ellsworth Plane Wrecked by Ice Jam

THE ELLSWORTH Antarctic Expedition was forced to forego its projected aerial survey of the Antarctic regions when the Northrop low-wing monoplane fell between two pieces of shelf-ice and after drifting helplessly for many hours was finally retrieved and found to be unsuitable for flying. Only one flight was made, that of 40 minutes' duration. With the loss of their plane, members of the expedition started their return to Dunedin. JAN. 14.

American Pilot Sets Speed Record

LEE MILES flew a four-cylinder engined monoplane to a new world's speed record at Miami over a 100-kilometer course at a speed of 209.11 miles an hour. The former record for planes of this category was held by the Frenchman, Delmotte whose mark was 207.31 miles an hour. Miles' plane was one he built himself. JAN. 17.

• Coming Events •

Dedication and opening, Shushan Airport, New Orleans, La. Air races and events. FEB. 9-13.

Second Annual Tucson Air Show, Tucson, Ariz., chapter National Aeronautic Association. Allen L. Stephens, president. FEB. 17-18.

Competition for design of dirigible airshed ends. Institute for Scientific Research of Experimental Airship Construction and Operation. Dirigeablestroy, Moscow, Russia. MAR. 1.

Entries for Wm. E. Boeing Scholarships close. Boeing School of Aeronautics, Oakland, Calif. APRIL 1.

International Show of Sport and Touring Aviation under auspices of Aero Club of Switzerland. Palais des Expositions, Geneva. APRIL 27-MAY 6.

Grand Prix of the Aero Club of France. Speed races between Deauville and Cannes and return for cash prizes and Armand Esders Trophy Cup. JULY 21-22.

Announcing . . .

THE CYCLOPS CAMERA

At last a sturdy, efficient, dependable aerial camera, costing less than $200, is available. Large purchases abroad make it possible for the Fairchild Aerial Camera Corporation to offer the CYCLOPS at a sensationally low price.

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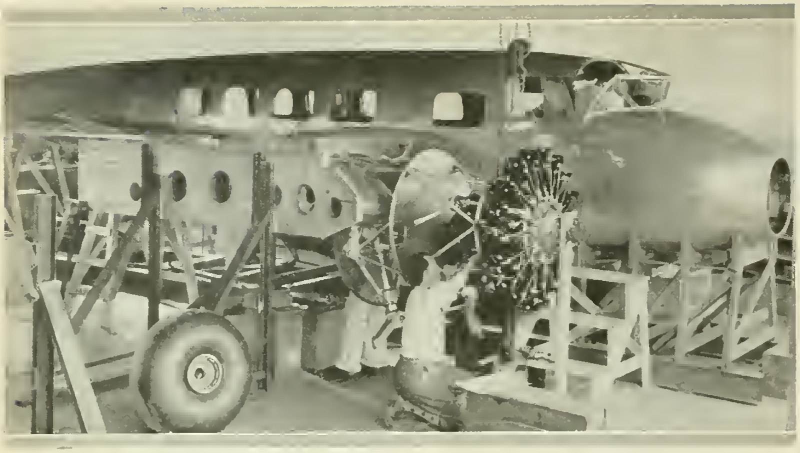

The first of the new Lockheed Electras under construction

(Continued from preceding page)

New Company Formed

BASIL AVIATION Company, Inc., has been formed by John L. Baker and Robert H. Silverman.

The new organization has leased 4,000 square feet of the former Ludington Aircraft factory at the Philadelphia Municipal Airport and has also purchased the entire stock of unassembled Keystone Commuter airplanes and parts from the Keystone Aircraft Corp. It will specialize in the purchase, overhaul and sale of used planes and engines in addition to its other activities.

October Production Slackens

AIRPLANE and engine production and deliveries for the first ten months of 1933 were slightly ahead of similar activities for the same period of the preceding year according to reports issued by the Aeronautical Chamber of Commerce. Slackening of manufacturing operations in the month of October, however, resulted in a decrease of the advance which the grand total of all production and deliveries made during the period being considered.

Military and commercial airplane and engine dollar volume is nearly 23 per cent ahead of 1932 at the date of the report, the weak spots being military airplane and engine activity, production of which is 4.4 per cent and 22.6 per cent respectively below the 1932 period.

The total value of commercial aircraft and engines during the first ten months of 1933 was $9,842,331, compared with $3,932,171 for the first ten months of 1932, a gain of 150 per cent.

Aero Chamber Elects Officers

THOMAS A. MORGAN was re-elected president of the Aeronautical Chamber of Commerce at the formal annual meeting held January 25 at the Hotel Biltmore, New York, N. Y.

Other officers chosen to serve with Mr. Morgan until January 31, 1935, were Leighton W. Rogers, executive vice-president; Donald W. Douglas, vice-president; Reuben H. Fleet, vice-president; Alfred Frank, vice-president; G. M. Bellanca, secretary; Charles L. Lawrance, treasurer; F. W. Barker, assistant secretary, and F. J. Walsh, assistant treasurer.

The executive committee consists of Messrs. Morgan, Douglas, Lawrance, Rogers, E. R. Breech, C. J. Brukner, L. D. Seymour and G. S. Wheat. In addition, a board of governors consisting of 25 members, one associate and one affiliate also was chosen.

TWA Makes Large Equipment Purchase

THE NEW Douglas transport which soon will go into service over Transcontinental & Western Air's coast-to-coast lines, will be powered by two Wright Cyclone engines and equipped with Sperry Automatic Pilots, according to large orders for such equipment just placed by the airline company.

Forty-one of these high-speed transports have been ordered by TWA in a $3,500,000 program calling for the replacement of flying equipment. When the planes go into service this spring, they will represent one of the fastest types in service over regularly established airlines in this country.

Rigid tests had to be met before equipment for the planes was accepted, according to Richard W. Robbins, president of TWA, who gave some insight as to what these new planes will be able to accomplish in the way of performance. Tests involved, he said, take-off with a full load of 17,500 pounds from an airport 4,500 feet above sea level, with one engine cut out after the plane had traveled half way down the runway. The plane continued the take-off and after climbing to 9,000 feet, flew on one engine to a point 240 miles away. In other tests, the plane, fully loaded, climbed from 6,000 to 8,000 feet with one engine in less than 10 minutes.

Installation of the Sperry pilots in these transports represents the initial instance in which a complete fleet of airplanes of the transport type was equipped with these devices.

Boynton Joins Pioneer

H. G. BOYNTON has joined the Pioneer Instrument Company of Brooklyn, N. Y., as purchasing agent. Except for a year as sales manager for a distributor of typewriters, Boynton has been connected with aircraft instrument companies since 1928; in that year he organized the aviation division of the Moto-Meter Company, and in 1930 became Eastern representative of the Elgin Watch Company's aircraft division.

(Continued on following page)

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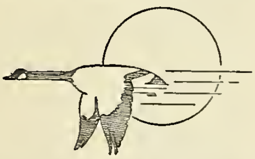

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(*Continued from preceding page*)

Lockheed Payroll Increases

NIGHT AND DAY shifts are working in the plywood division of the Lockheed Aircraft Corp., Burbank, Calif., plant rushing to complete orders for planes of the Orion type for airlines and private owners. At the same time metal-working crews are busy completing the first of three bi-motor Electras for Northwest Airways. Employment has jumped from 51 in May to more than 300.

Net earnings of the company increased sharply during the third quarter of 1933, according to Robert E. Gross, treasurer, amounting to $20,282.70 after all charges. This compares with net earnings of $28,117.23 after all charges for the first nine months of 1933 and a deficit of $9,946 for the period of incorporation from June 21, 1932, to December 31, 1932.

Mulzer Sells Comet Stock

MAJOR LESLIE G. MULZER, president and treasurer of Mulzer Flying Service, Inc., Wisconsin Rapids, Wis., announced the sale of all of the special tools and complete stock of Comet parts to Automotive Indicators, Inc., of Memphis, Tenn.

The Mulzer company purchased these parts and tools in 1930.

Swallow Plans 1934 Models

MANUFACTURING PLANS for 1934 of the Swallow Airplane Co., Wichita, Kan., include the introduction of two new models, both of which will be popular priced cabin monoplanes, and entirely different from preceding models. A feature will be the debut of the Swallow single-wing type. The first of these planes will be a small two-place job, according to E. B. Christopher, general manager and owner. The Swallow training planes also will be continued in production.

Christopher was formerly western sales manager for Travel Air and Curtiss-Wright Sales Corp., having charge of all sales in the western half of the United States. Upon his resignation three years ago, he managed the Christopher Airplane Service, which conducted a general aviation business including repair, rebuilding, charter and student instruction and sales. The Christopher company will continue in this same business in its hangar at the Wichita municipal airport.

Lear Moves to New York

LEAR DEVELOPMENTS, Inc., manufacturers of radio equipment for aircraft is moving its offices to New York City, according to William P. Lear, president. The firm has been located in Chicago for some time and once had a shop in a hangar at Curtiss-Reynolds Airport, Glenview, Ill.

Only recently Lear Developments announced the introduction of a new aircraft transmitter and an airport transmitter, both of which were built especially for L. B. Bonfoey, chairman of the Illinois Aeronautics Commission.

Louisiana Features Speed Race

A FEATURE OF the Pan-American Air Races to be held at Shushan Airport, Louisiana, La., February 9-13, inclusive, will be a free-for-all Sweepstake race in the 550 cubic inch or less motor displacement category. This event is being sponsored by the Shell Petroleum Corporation which will award the Shell Sweepstake Trophy plus $3,300 in cash prizes to the winners.

The official schedule of free-for-all closed course races offers competition in the following groups: 220 cu. in. or less; 375 cu. in. or less, 550 cu. in. or less and the 1000 cu. in. or less, international land plane free-for-all.

The races are being held concurrently with the Mardi Gras season and, under the direction of Cliff and Phil Henderson, will officially open the new Shushan Airport.

Fairchild Sold for Export

A Fairchild 22, Warner powered, was sold to Charles A. Zwicky of Puerto de Sta. Maria, Spain. Mr. Zwicky will use his new ship privately and introduce it to his aviation club.

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"And why not?" we ask. Why not build a new airplane that will establish new performance records. ¶ The chaps who write aviation advertising have been using a lot of superlatives, in the last few years. They are the fellows who gave us the idea—to build a ship that would make these superlatives a reality. Actual performance . . . not just ad copy. Not "strong statements" . . . but facts! ¶ Always mindful that a new airplane, to gain any degree of popularity, must compete with other established modes of transportation, on maintenance as well as initial cost. ¶ Yes, the New 225 H.P. Beechcraft is a new airplane . . . a better airplane! And if you are skeptical, write for informative literature—advertising, sans "advertising talk."

The Beech Aircraft Company
WICHITA, KANSAS

FOREIGN NEWS IN BRIEF

Australasia

A REMARKABLE record for consistency is being made by Pilot Keith Virtue, who has flown six days a week for 12 months while in the employ of New England Airways. Flying over the Sydney-Brisbane route, Virtue has yet to miss a run, and has brought his flying time to 1,560 hours and his mileage for the year to 168,000. He has recorded two fast trips, one of which is a new record for a flight to Lismore. Flying a 400-mile run, he negotiated the distance in 2 hours 38 minutes.

RECENT REPORTS concerning the activities of Sir Charles Kingsford-Smith have linked him with the inauguration of an airline between Auckland and southern points in the Dominion, while other reports indicate that he has been appointed to the staff of the Vacuum Oil Co., Ltd., in an advisory capacity on aviation matters.

THE AUSTRALIAN Inland Mission has decided to extend aerial medical service by establishing additional bases and airplanes at an annual cost of between £15,000 and £17,000.

THE QANTAS company recently completed more than 2,000,000 miles of flight in airline operations. As a further step in its expansion activities, the company plans to form a new operating organization if its bids on the Singapore-Brisbane and Cootamundra air services are accepted by the government. The new company, it is understood, will be Australian, but will have the support of Imperial Airways.

TATA SONS, LTD., of Bombay, operators of the Karachi-Bombay-Madras air mail service completed its first year with a record of having never delayed the mails. The route entails operations over some 1050 miles in both directions, the schedules being flown by two Puss Moths and a Fox Moth. The company flew 137,280 miles on regular mail flights and 21,450 miles in taxi work. A Bombay-Calcutta service, on a daily schedule, is now under consideration.

Belgium

THE S. V. 5 is a new training plane designed for the Belgian Army. It is of metal and wood construction, powered with a Siddeley *Serval* engine and has approximate performances as follows: Top speed 169 m.p.h.; landing speed 50 m.p.h., and ceiling, 21,000 feet.

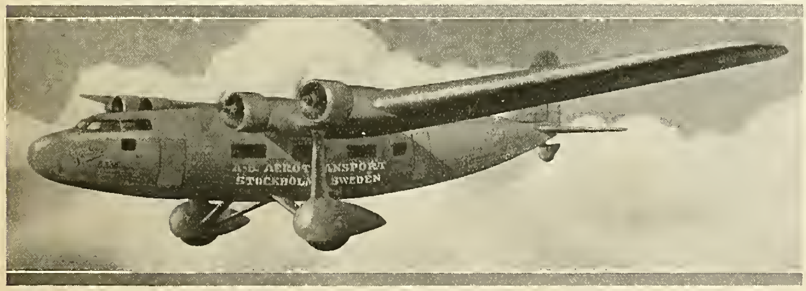
ANOTHER ORDER for British Rolls-Royce *Kestrel* engines has been placed by the Government. This time the contract provides for the supply of 24 engines for installation in planes built for the Army Air Regiments.

PLANES OF the Belgian Air Transportation Company in a single month flew 108,107 miles and carried increasing numbers of passengers. Mail and express also showed a decided increase. At the Brussels airport incoming traffic during one month was 393 planes, 1,789 passengers and 12,994 pounds of mail. Outgoing traffic included 394 planes, 1,729 passengers and 8,576 pounds of mail.

Canada

ALL REPORTS point to 1933 as a record year for air mail poundage in Canada. The reports for the first three quarters of the year all show increases over those of 1932, and with only the final figures to be added, approximately 500,000 pounds of air mail will have been carried on 13 routes, practically all of which served outlying districts in the northland.

OFFICIAL FIGURES to October 31, 1933, show that there were 377 active pilot licenses, 426 commercial pilot licenses and 392 air engineer certificates in force. At the same time, 341 aircraft were registered; 50 for private use and 291 for commercial purposes. With the exception of commercial aircraft all figures show moderate increases over those at the beginning of the year.



26-place Fokker F-22, now under construction, to be powered by four P. & W. Wasps

THE TWENTY-FIFTH anniversary of flight in Canada will be celebrated February 23. Twenty-five years ago J. A. D. McCurdy flew his *Silver Dart* a distance of half a mile at an altitude of 30 feet over the ice of Baddeck Bay, at Baddeck, Nova Scotia.

Great Britain

THE LOW-PRICED airplane fad seems to have gained some headway in Great Britain. A notable stimulus to aviation in that country is expected to result from the development of an unusually low-priced aircraft engine which will permit the construction of a practical airplane to sell for about $583.

This new engine, being developed by a well-known Bristol manufacturer, has yet to pass the Air Ministry tests, but it has already been successfully tested for a greater number of hours than the government requires. It has two horizontally opposed cylinders with overhead valves and detachable heads. The crankcase is of aluminum casting, the cylinders of cast iron and the crankshaft of high-grade case-hardened steel.

AIR MARSHAL Sir Robert Brooke Popham, Air Officer, Commander-in-Chief, Air Defense of Great Britain, has been appointed Principal Air Aide de Camp to H. M. the King, succeeding Chief Marshal Sir Edward Ellington, Chief of the Air Staff.

THE NAPIER Series IV engine has been added to the "H" group developed by the Napier company. The new engine has 24 cylinders built up in four banks of six each, two banks being geared together through the propeller shaft in between, thus reducing frontal area. At maximum r.p.m. of 3,900, the engine develops 385 h.p.

THE TWO four-motored 43-place airliners ordered from Short Brothers of Rochester, by Imperial Airways, are expected to go into service soon. Powered by Bristol Pegasus engines, these land planes will be similar to those of the Scipio class of flying boats now operating across the Mediterranean, but will differ in that the fuselage will be slung underneath the lower wing.

AN AERIAL ascent, which he hopes will attain about 17 miles, will be undertaken this spring over England by M. E.

Some of the 50 Wright-powered Curtiss Hawks recently sold to the Chinese Government

Ridge, an American, who is being assisted in his preparations by Professor J. S. Haldane, an eminent authority on respiration, and Sir Robert Davis, an inventor. Ridge plans to go aloft in the open basket of a balloon and will wear a specially designed suit which he believes will enable him to successfully complete his mission.

INDICATIONS THAT competition in the MacRobertson England-Australia race will be exceptionally keen are noticed in the announcement that the Airspeed Company is now building a monoplane similar in general lines to the Courier, but with two engines mounted in the wings. One of the planes will be powered by Armstrong Siddeley *Cheetah* engines of 300 h.p., and it is this plane that is being groomed for the race.

THE JOHNSON Memorial Trophy for 1933 has been awarded to Jimmy Mollinson by the Guild of Air Pilots and Air Navigators of the British Empire. The award, which is bestowed for navigational feats, is in recognition of the flier's crossing of the Northern Atlantic in 1932 and of the North and South Atlantic during 1933.

HESTON AIRPORT showed an increase of 123 per cent in school flying hours during the month of September when figures for 1932 and 1933 were compared. For the first ten months of 1933, flying hours were more than 32 per cent higher than 1932.

FASTER SERVICE between London and Paris is expected when a new-type monoplane, capable of carrying 20 passengers at a cruising speed of 135 miles an hour, goes into Imperial Airways' service. These planes are planned to be modifications of the Atalanta type and will have four 400-horsepower engines set underneath a monoplane wing.

Italy

CORROSION AT the Ostia-Roma airport is threatening to undermine the buildings on the field, and the mooring and landing area. To combat this menace, the government has appropriated about $114,900 for the construction of a breakwater to be built at the mouth of the Tiber River.

DESPITE DECREASES in appropriations in the Army and Navy budgets for the fiscal year ending June, 1935, the Air Ministry will receive an extra appropriation which will bring its total to $63,900,000. The entire military budget is understood to be in the neighborhood of $422,000,000.

AN AGREEMENT between the Italian Air Ministry and the Dutch airline, KLM, has resulted in provisions for making a stop at Rome en route to Batavia or Amsterdam. KLM will therefore, operate passenger, mail and express service to and from Rome, but will not compete with the Italian airlines connecting Athens and Marseilles.

ALTHOUGH VARIOUS airline companies have suspended operations over many routes during the winter season, some were expected to resume during the latter part of January. The routes affected were between Rome and Milan, Brindisi-Athens-Instanbul, Brindisi-Athens-Rhodos, Fiume-Brioni-Venice and between Portorose-Trieste-Zara.

Russia

IN CO-OPERATION with the Osoviakhim, a nation-wide organization of aviation enthusiasts, the Soviet Air Fleet Academy is completing tests on the G-10, a new plane designed by V. K. Gribovsky for training and sport purposes. The plane, of all-wood construction, is powered by a 65-horsepower engine and attains a maximum speed of 160 k. p. h. In addition, it features folding wings.

South America

THREE AMERICAN planes, owned and operated by the Colombian Air Company have been flying between Bogota and Medellin for the past four months. The greatest source of business comes from a Bogota newspaper which is under contract with the airline. Some mail and passengers also are carried.

OFFICIAL SANCTION for air service between Buenos Aires and Mar Del Plata in Argentina has been awarded, the concession to run for a period of five years.

THE MINISTRY of Marine and Aviation of Peru has been authorized to obtain a site on the Cayhuana farm near Huanuco, Peru, for the construction of an airport.

Spain

SERVICE BETWEEN Seville and the Canary Islands has been inaugurated by the Spanish Air Mail Line, which temporarily is transporting mail and express matter only, waiting until the route has been thoroughly tested before making a bid for passengers. Trimotored Fokkers are used.

A SLIGHT decline in air traffic is shown for the first nine months of 1933 as compared with the same period in 1932. Miles flown in 1933 were 254,600 as against 292,679 in 1932. The number of passengers carried fell from 4,983 to 3,600, the mail poundage fell from 141,725 to 126,844, while express poundage decreased from 40,538 to 33,350.

The number of flights in the 1933 period was 889 compared with 1,026 in the earlier period and the number of hours flown was 2,702 compared with 3,107.

AIRSHIP TERMINAL charges to apply at the Seville airship base, include a landing charge of $124.30 per 882,861 cubic feet; payment of the ground crew, plus a surcharge for gas and oil used. Additional charges will be made for the use of water and hydrogen.

Sweden

AIR SERVICE between Stockholm and Visby, on the island of Gotland, a summer resort, may be extended to Riga, Latvia, early this year. During the three months it operated last year, the line carried 1,714 passengers. Another extension of service, this one planned for 1935, will take the Swedish Air Transportation Company's route from Stockholm to Tallinn, via Helsinki, and a Russian company's line from Tallinn to Moscow by way of Leningrad. Twelve airports, situated along a lighted airway, will be built.

MILITARY AND commercial authorities are now testing airway beacons with a view to obtaining the most suitable equipment for the Malmo-Stockholm and other routes in the country. It is planned to mount the lights on 60- or 75-foot towers at intervals of 15½ miles.

PERSONAIRLITIES

(*Continued from page* 34)

mechanics, who seldom got shot, even by their own pilots. Jimmy returned safely to his fellow citizens in April, 1919, and was discharged at San Diego, only to re-enlist immediately at March Field and to be appointed a flying cadet in January, 1920. At the termination of his course in February, 1921, he was discharged. As a cadet he had been one of the first to do forest air patrol, through 1920 and '21, on Hisso Jennys.

After his discharge, Jimmy James joined the Standard Oil Co. of California as a salesman, but in 1925 returned to flying as a civilian pilot in the Forestry Service, using Army equipment. When Harris M. Hanshue was organizing Western Air Express, Jimmy decided to fly air mail. He was hired by Major C. C. Moseley along with Fred W. Kelly, Fred De Garmo, and Maury Graham, who perished in a blizzard when forced down with the night mail near Cedar City, Utah, in 1930. Jimmy James flew the first air mail plane into Los Angeles, April 17, 1926, and later flew the first night section out of Los Angeles. He has had over 7,000 hours in the air.

ALICE IN BALLYHOOLAND

(*Continued from page* 19)

"What shall I wish?" asked Alice, as the March Hare and the Dormouse crowded in beside her.

"Wish that it goes up, of course," said the Mad Hatter sharply. "Now, all together—we wish to go *up!* Are you all wishing? Again—*we wish to go up!*"

Afterwards, Alice tried to remember just what happened, but she was never very clear about it. She remembered that the Mad Hatter cried, "Turn on the publicity," and that the Dormouse turned a little tap. The room became filled with smoke and a roaring and clanking noise, which might have been the publicity pouring into the engine, for all Alice knew. The whole machine heaved and rolled alarmingly for a moment, and then it fell apart with a faint hiss. Alice felt herself falling, and saw the Mad Hatter and the March Hare and the Dormouse all looking very startled. And the next thing she knew she was back in her apartment on Park Avenue, blinking her eyes and yawning.

And to this day Alice doesn't know whether she fell asleep and dreamed it all, or if she really had been in Washington visiting the Department of Commerce. For Washington is a very remarkable place, filled with very extraordinary people, mostly dreamers. And in a place like that, thought Alice, almost anything could happen. She smiled dreamily, picked up the bottle of rye, and poured herself a New Deal.

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Used Planes and Engines

FOR SALE OR TRADE: Warner Cessna, 10 hours since major overhaul; full set Pioneer instruments, NACA cowling, ship in A-1 shape. Also a J-5 Ryan B-1, less than 10 hours on motor since major overhaul. Ring cowling for motor. Ship recovered one year ago. Price Cessna $1,500 and Ryan, $1,500, or will trade one or both for good J-6 Cessna, Stinson Jr. or Waco cabin. What have you? V. C. Tisdal, Jr., Elk City, Oklahoma.

WACO F upper left wing, uncovered, factory rebuilt. Waco 10 upper left wing, uncovered, approved. American Eagle fuselage (Model A-1), including landing gear, engine cowl, (except top engine) tail surfaces, and OX-5 engine. All priced for immediate sale. Michigan Aeronautical Corporation, Ypsilanti, Michigan.

GREAT LAKES: Fine condition. 225 hours. Semi-air wheels, new propeller, air speed indicator. Licensed. Privately owned. Priced to sell. Michigan Aeronautical Corporation, Ypsilanti, Michigan.

STINSON SM-8A: 501½ hours total time. Fuselage and tail sections completely recovered; completely reupholstered; Lycoming engine completely overhauled with new crankshaft, new rings, etc., installed; new Exide storage battery; new control cables; equipped for night flying, including retractable Ryan landing lights; propeller etched and huffed; all Pioneer instruments, including large bank and turn; Insignia blue and Loening yellow finish; licensed until January, 1935. In A-1 condition. Price $1,985. Never cracked or damaged in any way. Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Penna.

BARGAINS FOR CASH: J6-330 Bellanca Pacemaker, needs recovering, $1,650; Warner Monocoupe, $1,450; Continental cabin Waco, $1,600; Challenger Travel Air, $800; J-5 Travel Air, $800; J-5 Stearman, completely overhauled, $1,000; DH American Moth, completely overhauled, $600; OX Swallow, completely overhauled, $250. AERO DIGEST, Box 1693.

FOR SALE: Cirrus Mark II, in fine condition. 100 hours total time, 10 hours since overhaul. Dr. O. B. Frye, E. Grand Rapids, Michigan.

HEATH LNB-4: Licensed. 40 hours total time; will sell or trade for two-place plane. Sam Egnot, 236 E. Second Street, Erie, Pennsylvania.

FOR SALE: Travel Air 6000, Wright J-6 motor; six-passenger; in good condition. Can be inspected Aviation Field, Augusta, Georgia. A. B. Kitchen, Cashier, Augusta, Goergia.

BUHL ARMY TRAINER: Real bargain. Wright 220, speed ring, steel prop, brakes, instruments, parachutes. Ship and engine 125 hours. Walter Berger, Marysville, Michigan.

HISSO EAGLEROCK: $450. Brakes, compass, etc. Ship in excellent condition. Free instruction until solo. OX Eaglerock, licensed. Ship in excellent condition, motor needs overhaul; $250. Free instruction. OX Command-Aire, motor just overhauled, $200. E. Marquis, Jamaica Sea Airport, Rockaway Boulevard, Jamaica, New York.

STINSON MODEL R: Less than one year old. Very little time. Always privately owned and flown. Custom finished black and red. Price $2,950. H. W. Bresee, 650 S. Salina Street, Syracuse, New York.

FLEET: Air wheels, turn and bank, air speed, etc. Streamlined head rest, instruments in rear; 232 hours total time; brand new Kinner K-5 front exhaust motor, No. 1606, seven hours motor time. Ship looks like new; just relicensed. Price $1,500. Will accept late model light car in trade. E. F. Dutro, Zanesville, Ohio.

GEE BEE SPORTSTER: Powered with supercharged inverted Cirrus. One of the best stunting and acrobatic ships made. Ship and motor have 120 hours. Low-winged single-place monoplane. For information, write: Dolly Bernson, 110 Parker St., Chelsea, Massachusetts.

TRAVEL AIR: 6-place; Wright J-6 330 h.p.; in perfect condition. Licensed October 1934. Can have services of pilot. Price, $2,500, a bargain. AERO DIGEST, Box 1698.

FOR SALE: The following motors. Two J-6 330 h.p.; one J6-7 250 h.p.; two J-4B 220 h.p. motors; one Warner Scarab 110 h.p. All these motors in excellent condition and priced to sell. Michigan Aero Motors, Jackson, Michigan.

MONOCOUPE: Velie; motor and ship in very good condition. Metal prop, cabin heaters; licensed to August 1934. Laurence B. Dobbs, 143 Hollis St., Jackson, Michigan.

SACRIFICE, WARNER STINSON: 4-place, used very little, total flying time 300 hours, excellent condition, private owner, licensed September 1934. $750 cash. 89 Villa, Buffalo, New York.

FOR SALE: 2-place cabin monoplane, Warner 110. Very stable and fast. Good cross-country or racing ship. Identified, in A-1 condition. Performance comparable to Warner Monocoupe. $485. William Boyd, 3751 Baytree Avenue, Pittsburgh, Pennsylvania.

STINSON JR. LYCOMING: Only 250 hours. Complete blind and night flying equipment. Sacrifice, $1,600. Fonda Aviation, Inc., Westfield Airport, Westfield, N. J. Rahway 7-2037.

WRIGHT J-5 TRAVEL AIR: 3-place, 465 hours; 65 since complete engine, plane overhaul. Heywood starter, extra instruments, lights; $1,450 cash, or trade on cabin ship. Valley Airways, P. O. Box 148, Winchester, Virginia.

FOR SALE: Velie Monocoupe, NC license; Axelson Spartan; tail group and fuselage; Travel Air 2000; Lycoming engine and new Lycoming parts; American Eagle 101 and A129 parts. Ozark Airways, Springfield, Missouri.

FOR SALE: J-5 Ryan 5-place cabin plane, licensed. Equipped with landing lights, electric starter. Alexandria Air Transport, Inc., Alexandria, Minnesota.

FOR SALE: The following ships at bargain prices: One new 75 h.p. 2-place Driggs; one J6-5 175 h.p. Spartan; one OX-5 Travel Air with air wheels; one J-5 or J6-7 Straight Wing Waco land or seaplane; one J6-9 330 h.p. Straight Wing Waco; brand new 45 h.p. Szekely Buhl Bull Pup; two J-5 Travel Airs. Photographs furnished if you mean business. All ships NC licensed, excellent condition and priced to sell. Will accept good late model cars on deals. Terms to responsible buyers. Write or wire Becker-Forner Flying Service, Inc., Jackson, Michigan.

J-5 WACO Straightwing, at a bargain. Gipsy Moth in good condition. Airplane parts. Approved Station 204. Charley Raudabaugh, 13210 French Road, Detroit, Michigan.

VELIE MONOCOUPE: Good condition. Licensed. Never cracked. Total time only 45 hours. For quick sale, $475. The H. C. Robbins Co., Cleveland Airport, Cleveland, Ohio.

WACO 10 OX-5: Licensed, in excellent condition. Navigation lights, hooded cockpit for instrument flying. Compass, turn and bank, air speed, pitch indicator. Never cracked, always kept in hangar. $575. Inquire Red Bank Airport, Red Bank, N. J.

WARNER-POWERED Waco F: Fuselage and wings just refinished. Bargain, $1,750, H. F. Wood, Avenue C and 19th Street, South, Birmingham, Alabama.

THREE-PLACE OX-5 Monarch, licensed. Never cracked; good condition; 375 hours; only $295. Want 3-place aircooled. Wallace Ang, 1010 Eighth St., Rockford, Illinois.

BRAND NEW SUPREME wood propellers, 65 to 240 h.p., $15 to $27.50. Good used American Eagle, OX-5, $435. Splendid J-5 Swallow, $1,000. New 3-place OX-5 Swallow, $900. New Swallow TP, OX-5, $800. Gipsy Moth, $875. Wheels, tires, tubes, parts, tubing, radiators, paint. Supplies at bargain prices. Swallow Airplane Co., Wichita, Kansas.

WARNER SCARAB COMMAND-AIRE: Licensed to January 1935. Motor and ship just overhauled and fuselage recovered. Steel propeller, duals, air wheels. $750 cash. R. A. Shelor, Sumter, South Carolina.

BARGAIN OFFERING: Aeronca, licensed, recovered. Total flying time, 175 hours. Plenty of extras. $295 cash or trade. Ray L. Harman, Huron, South Dakota.

BARGAINS: All exceptionally fine condition. Waco Cabin, $2,250. Waco 10, $550. Bird, extras, $1,200. Taylor Cub, $800. Crosley aircraft radio, complete, $45. The H. C. Robbins Co., Waco Distributors, Cleveland Airport, Cleveland, Ohio.

MOTH GIPSY: Completely rebuilt and recovered; motor recently overhauled: Metropolitan area. Very reasonable. AERO DIGEST, Box 1711.

FAIRCHILD: Absolutely new. Model 24, cabin two-place, side-by-side, dual controls. Warner 125 motor, steel prop, starter, pants. $3,000 cash, no trades. Private owner. Andrew Forthmann, 435 South Lafayette Park Place, Los Angeles, California.

FOR SALE: Arrow Sport, Bellanca Pacemaker, Curtiss-Wright Coupe, Curtiss-Wright Thrush, Eaglerocks, Fleet, Swallow, Travel Airs and many other good used planes, all priced to sell. Write or wire for February listing of used planes. Hoosier Airport, Inc., Indianapolis, Indiana.

DH MOTH: Steel fuselage, airwheels, thermopete, special paint job, Pioneer instruments, including airspeed; cockpit and engine covers, duals, full set of tools, navigation lights, new British Airscrew; engine factory majored 85 hours ago. Excellent condition. Licensed August 1934. Ship in New York area. $875 cash. AERO DIGEST, Box 1701.

ARROW SPORT: In first class condition, two LeBlond motors, licensed till June 1934. Will sell reasonably, with one or both motors. Dolly Bernson, 110 Parker St., Chelsea, Massachusetts.

LE BLOND 60 engine, complete with mount and Marshall approved propeller. Less than 100 hours since factory overhaul. $150. F. M. Coray, Weslaco, Texas.

STINSON SM-8A: Painted black and international orange; licensed to October 1934; retractable landing lights; leather upholstery; bank and turn, rate of climb; ring cowl; full air wheels and brakes; fuselage recovered at Stinson factory; total time. 450 hours; time since factory overhaul, 80 hours; latest type cam idler gear bolt installed; not flown from July 1932 to October 1933; $1,350 for quick sale. Air Service, Inc., New Castle, Delaware.

1929 LICENSED American Eagle OX-5, ground looped, two lower panels damaged. First $100 takes it, will trade for 1930 Ford. Brown, 138 Ringold, Dayton, Ohio.

FOR SALE OR TRADE for Stinson: J-5 Taper Wing Waco in excellent condition, just relicensed; has ring on motor and is equipped for inverted flying. Total time 350 hours. Price $1,400. Andy Stinis, Floyd Bennett Field, Brooklyn, New York.

ENGINES: One new, 1933 model, 7-cylinder Jacobs; one new, inverted, American Cirrus; one used J6-5; one used DeHaviland Gipsy. New pr. 22 x 10-4 Goodyear Airwheels with brakes, $75 complete. Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

$650 IS rock bottom for the best Avro Avian in America. Ship licensed to November 1934. Gerry Moller, New Canaan, Connecticut.

KINNER K-5 American Eagle, short nosed late 201 model, perfect condition. Lowest bidder takes it. Also Travel Air, Kinner parts. Carl Seltzer, 1909 River View, Endicott, New York.

FAIRCHILD 22: Cirrus; 24 hours since complete overhaul, $1,350; Aeromarine Klemm, Salmson, licensed, good order, $350; Avro Avian, perfect order, $600. Flying Dutchman Air Service, Somerton Airport, Philadelphia, Pennsylvania.

CHALLENGER FLEDGLING: Recent major overhaul and complete recover job, $850. OX-5 Robin, wings recently recovered, $450. OX-5 Parks P-1, good shape, new tires, $350. Tank-powered Waco 10, good shape, $550. Above list includes exceptional bargain in Tank-powered Waco 10. We also have spare Waco 10 wings, center section, ailerons, axles, etc., at lowest prices. John T. Corrodi, Box 185, Bexley Station, Columbus, Ohio.

USED PLANE BARGAINS: Aeroncas, Bellancas, Eaglerocks, Monocoupes, Robins, Stinsons, Stearmans, Travel Airs, Wacos. Trades considered. Used parts for most motors and planes at ridiculous prices. Write us your wishes immediately. Rapid Air Lines Corp., Omaha, Nebraska.

STINSON, SR.: Must sell immediately. Factory overhauled. New covering, paint, leather seats. Electric starter. Beautiful condition throughout. W. Cameron, Pettibone, LaCrosse, Wisconsin.

FOR SALE: OX-5 motor, 22 hours. OX-5 motor, 276 hours. Propeller. 750-125 M. M. wheels and tires. Command-Aire ship complete. Can be licensed or will sell parts. Joseph Marchner, Ohio Street, Rochester, New York.

FOR SALE: Fairchild 22, 50 hours, $1,500. Stearman, just recovered, 100 hours on
$1,350. Challenger Travel Air, 72 hour
$1,250. Warner Aristocrat, late motor, e
Gipsy Moth, 40 hour motor, $650. Sik
$7,500. Lockheed Air Express, many ex
Aero Brokerage Service of N. Y., Mi

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Used Planes and Engines

BUHL SIX-PLACE: J-6 300 h.p., 180 hours total time. Buhl eight-place, new Cyclone, 30 hours total time. Buhl Bull Pup, in perfect shape. We just completed buying most of the Buhl Aircraft. New Simplex Midwing, never flown, less motor. New Simplex Low-wing Speedster, less motor, never flown. Every ship a bargain. Sun Aero Motors & Supplies, 10529 Gratiot, Detroit, Michigan.

CURTISS-WRIGHT SEDAN: 4-place cabin monoplane, 185 h.p. Challenger engine. Like new, under 200 hours. Also Wright J6-7 Cessna and spare Wright J6-7 engine, completely overhauled. Low prices for quick sales. Address Safair, Inc., Hangar B, Roosevelt Field, Mineola, New York.

KR-34 3-PLACE open biplane. Major overhauled and recovered. New Comet motor, steel propeller, air wheels, tail wheel, brakes, new type valves, 3-tone blue and tan sport paint job, special upholstery. Bargain at $1,800. Charles F. West, Teterboro Airport, Hasbrouck Heights, N. J.

HIGHEST OFFER over $750 buys Challenger Robin recently recovered throughout or will trade for small amphibion or Fleet. Robert Turner, Box 18, Asheville, North Carolina.

ROBIN: Millerized OX-5, new tires, licensed to September, excellent condition; Fahlin propeller, new Bosch magneto, duals; $700; consider Aeronca in trade. Harold Price, Devils Lake, N. D.

CESSNA: Warner-powered, 185 on motor. Licensed to August 1, 1934. Fully equipped: Brakes, special tail wheel assembly, straightaway compass, turn and bank, rate of climb, navigation lights, etc. Lowest cash price, $995. P. F. Smith, Main Line Airport, Paoli, Pennsylvania.

FLEET: Kinner 125 h.p.; Aeronca C-3 Aeronca C-2; Waco OX-5. All ships overhauled, licensed, excellent condition. Reasonably priced. Air Activities Airport, West Chicago, Illinois.

FOR SALE: Hornet Loening amphibion; J6-9 Loening Commuter amphibion; J6-9 6000-B Travel Air; Lycoming Stinson; Challenger Fledgling. O. J. Whitney, Inc., North Beach Airport, Long Island, New York. Telephone: Havemeyer 4-9600.

BARGAIN: Travel Air C-4000, 3-place, new Challenger 185. Ship practically new throughout. Tail wheel, lights, speed ring, oversize tires, extra instruments. $1100, cash. AERO DIGEST, Box 1708.

NEW EAGLEROCKS and Flyabouts at attractive bargain prices. Special prices on new J-5 and Comet Eaglerocks with semi-air wheels, brakes, compass, starter and your own color combination. Write for details. Aircraft Mechanics, Inc., Colorado Springs, Colorado.

R. S. V. MONOPLANE: Complete less motor. Takes Kinner. $95. Can't be licensed. Charles F. West, Teterboro Airport, Hasbrouck Heights, New Jersey.

FOR SALE: Whirlwind 220 Eaglerock, model A-1. Licensed; like new. OR trade for lighter plane. Prefer Waco F type. AERO DIGEST, Box 1710.

SACRIFICE PRICES on used planes. Specials on Eaglerock, Junior, Travel Air, J-6 Robin, American Eagle and others. List your used ships with us. Aircraft Mechanics, Inc., Colorado Springs, Colorado.

FOR SALE OR TRADE: Travel Air, 175 h.p., model E-4000. Driggs, powered with Rover 75 h.p. Stinson, Sr., 330 h.p., six-place, with ATC for floats. Cavalier Lambert coupe. Waco 10, OX. Lincoln-Page OX. Ships like new and in A-1 condition roughout. Terms to responsible parties. Central r Service, Grand Rapids, Michigan.

T LAKES: Sport Trainer; 25 hours since
verhaul. New cylinders, pistons, rings,
uides, etc. Better than new. Recently
Fully equipped. Balloon tires, naviga-
duals, etc. Best Great Lakes in coun-
Monroe Flying Service, Municipal Air-
ster, New York.

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Gipsy motor.
both in A-1
ways hangar
Richard Beele
Nebraska.

CURTISS THRUSH: 6-place, fuselage blue, wings orange, engine modernized J6-7, perfect, standard instruments. This is "Outdoor Girl" endurance record ship. Price, $1,500. Erickson and Remmert, Floyd Bennett Field, Brooklyn, New York.

FOR SALE: OX-5 Travel Air, excellent condition. Steel prop, air wheels. Licensed till April. New spare motor. $495. Henry Waldheim, 187 Midland Ave., Arlington, New Jersey.

CESSNA J-5: Good condition, used less than 100 hours. First reasonable cash offer or will trade. C. E. Godfrey, 16223 Whitlock Avenue, Detroit, Michigan.

FOR SALE: Two J-5 Travel Airs, excellent condition, fully equipped, NC licensed and priced to sell. Will accept good late model car on deal. Terms to responsible buyers. P. O. Box 66, Jackson, Michigan.

Miscellaneous Products & Equipment For Sale

FOR SALE parts and motors: Szekely; J-5 motor; 2 Dayton Bears, new; Cirrus; Waco 10; Great Lakes; Fleet; American Eagle. J. J. Williams, Forest Hotel, 920 Forest, Kansas City, Missouri.

DON'T BUY anything until you get Ort's 1934 Aviation Material Catalog. Prices are lower. Send one thin dime today. Karl Ort, 525 W. Poplar St., York, Pennsylvania.

ACROPLANES: 1 used Acroplane, fair appearance, perfect mechanically, $750; 1 Acroplane demonstrator, fine appearance, perfect mechanically, $1,250; 1 Acroplane, brand new model A (U frame), $1,850. Prompt delivery. Finance charge if bought on time payment plan. Address R. F. Rice, Inc., 220 East 138th St., New York, N. Y.

WARNER & KINNER parts bought and sold. New and used OX parts for sale. Crack-ups purchased. Quotations furnished. AERO DIGEST, Box 1699.

AIRPLANE TOW BANNERS with scientifically built detachable letters. 1934 prices and terms. Discount to dealers. Your chance to make more money. Light plane banners. R. V. Trader, Mfg., Dravosburg, Pennsylvania.

MODEL A EAGLEROCK parts. Waco F-2 center section and right upper. Lockheed parts. Continental 165 parts. Wasp nose cowling with shutters. Charley Raudabaugh, 13210 French Road, Detroit, Michigan.

THIS MONTH'S BARGAINS: All or part of two latest model R-1820-F Cyclone motors, total time 20 hours, including three-blade propellers. Wasp B motors, good condition, $650 each. New Kinner crankcase, $40. Hisso, Liberty, Hall-Scott and all water-cooled motors, best offer. Standard steel propellers, $30 to $75. New 24x4, 28x4, 30x5, 26x5, 32x6, 36x8, non-skid straight side casings, $3 to $6 each; 48x12, $11; 750x125, 900x200, $5 each. All tubes 65% off. Small 14x3 industrial type, four-ply tires, tubes and disc wheels, $9; and 20x4, $11. New altimeters, $2 and $3 each. Luminous dial oil gauges, 120 and 200 lb. pressure, $1. 6-pound fuel gauges, 75c. Distance thermometers, best quality, $2.50 each. Sixteenth-inch waterproof birch plywood, 4 feet by 40 inches, $1 per sheet. Best quality Flightex fabric, 35c per yard; remnants, 22c. Flightex tape, $2.50; good tape, $1.50 per hundred yard roll. Bendix wheels, with or without brakes. All sizes wire wheels. 800x10 wheels, with or without brakes. Tail wheels, from $1 to $12 each. Inertia starters, $10 to $25 each. Nickel steel bolts, spark plugs, aluminum, turnbuckles at exceptionally low prices in quantity lots. 10 absolutely brand new 60 h.p. Siemens-Halske motors in original crates, latest model dual ignition, $250 each. 400 rubberized weather-proof flying suits, with zippers, all sizes, brand new, $3.75 each; cost Navy $26. 30 brand new Hornet crankshaft assemblies, complete in original boxes, $30 each. 300 new Hornet piston assemblies, with rings, $5 each. New valves, $6. Cam, timing, blower and all other gears; thrust, roller and all bearings. Master rod assemblies, pins, bushings, everything for Hornet motors, brand new, 80% off list. 20 assorted brass gas line fittings, any size, $1. B. G. spark plugs, new, 50c. "If it flies we have it." Crawford Airplane Supply Company, 350 Washington Boulevard, Venice, California.

PROPELLERS: Lowest prices in the country. Steel props for J-5, J-6. Brand new late production Hamilton wood for all makes except OX-5, $25. Marshall and Bennett propellers for all motors. Central Air Service, Grand Rapids, Michigan.

USED AIRPLANES AND PARTS: We may have just what you want. New or used parts. Wings, propellers, struts, etc. Pioneer Aircraft Supply, Airport, Syracuse, New York.

LEFT LOWER WING for Bird. Guaranteed. Kinner B-5 cylinder head, $27.50. John Steinert, 219 South 29th, Omaha, Nebraska.

CONTINENTAL 210 h.p., new; Continental A-40, new; Wright J-5, 220 h.p., only 79 hours since new, not another one in the country like it. Supercharged Inverted Cirrus, 110 h.p., nearly new. One Velie motor and three new Szekely motors, also the biggest supply of genuine Szekely motor parts, in the country. One J-6, 300 h.p., 180 hours. One 575 h.p. Cyclone, 30 hours since new. Really the biggest supply of good motors available. We don't have tampered motors or gyp parts. Buy with confidence. Sun Aero Motors & Supplies, 10529 Gratiot, Detroit, Michigan.

AUTOGIRO BLADES and rotor mechanism, like new, only 13 hours time, perfect. Airplane parts for Stinson, Simplex, Monocoupe, Buhl Sedans, Buhl Bull Pups. Also air wheels and tires. Shop and save at Sun Aero Motors & Supplies, 10529 Gratiot, Detroit, Michigan.

WINGS: Order yours before the spring rush. $5 to $15 discount till March 1. American Eagle, Waco 10, Waco C, Waco F, Travel Air, Eaglerock, Bird. New London Aircraft, New London, Ohio.

$250 BUYS woodworking machinery for approved shop. Bandsaw, table-saw, planer, jointer, shafting, counter-shafting, belts; heavy machinery, excellent condition. Yankee Aero Parts, New Canaan, Connecticut.

SALE OR TRADE: Kinner B-5, 125 h.p. engine, latest heads; 130 hours time; none since major overhaul; $650. F. A. Repp, 926 S. 60th St., Philadelphia, Pennsylvania.

EXPERT REPAIR WORK: All types of planes. Only the best obtainable materials and workmanship go into our repair jobs. Moderate prices. Approved repair station rating. We have an enormous stock of surplus material. Write for bargain prices. Aircraft Mechanics, Inc., Colorado Springs, Colorado.

Miscellaneous Services Opportunities, Offers, etc.

IT'S HERE: Used Aircraft Directory. Practically every type and price of used plane. Complete description with owner's price and name and address. Air-cooled, $250 up; OX, $110 up, flyaway. Mostly licensed, airworthy; terms, trades, instruction. Send $1 for six months, or 20c sample copy. If you have a plane for sale, a card will bring you good news. If you want to buy you cannot afford to be without it. Used Aircraft Directory, Athens, Ohio.

RADIO ENGINEERING: Broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Allen Street, Valparaiso, Indiana.

GOOD OPPORTUNITY for airplane mechanic: Trade one-half interest in good, going machine, welding and blacksmith shop, fully equipped, for 125 Kinner Bird or similar ship. Must be in A-1 condition and licensed. Frank Granite, Katalla, Alaska.

LEARN TO FLY FREE: Transport pilot needs a live wire helper as co-pilot. Will sell half interest in six-place ship to young man. Will teach him to fly while ship is making money; profits 50-50. Ship made $8,000 last year. AERO DIGEST, Box 1697.

AVIATORS ATTENTION: If you want to use the best aerial advertising device on royalty basis with little money, write Picco, Interstates Aerial Advertising Co., 509 Fifth Ave., New York, N. Y.

AVIATION: Airminded young men interested in entering aviation as apprentices. Write, enclosing stamp, to Mechanics Universal Aviation Service, 12883 Mansfield, Dept. 6, Detroit, Michigan.

Help Wanted

WANTED: High class airplane and engine mechanic, good on all-round work; good personality; fair education; not afraid of hard work; to take over service department on established Southern airport with good facilities; on percentage basis. Probably $50 to $85 per month to start. Every assistance will be given to increase business. Write details, experience and general particulars, giving references. AERO DIGEST, Box 1707.

ENGINEER: Qualified in stress-analysis and every way competent to become Chief Engineer of company organizing for mass production of $700 airplanes. Applicants willing to accept stock in company for part salary until airplane approved and Government loan obtained. State experience, salary, etc. Aircraft Development Company, Box 1323, Washington, D. C.

Parachutes For Sale

PARACHUTES: Approved type. Seat, back, lap and chest; bought and sold; exchanged, repaired. Tell all first letter. Professional parachute jumpers and balloonists furnished for all occasions. Thompson Brothers Balloon and Parachute Co., Aurora, Ill. Established 1903.

Positions Wanted

SINGLE GIRL: 24, well educated and ambitious, desires position with aviation school. Five years' office experience. Flying time part pay. AERO DIGEST, Box 1695.

TRANSPORT PILOT: 700 hours. A & E mechanic. Experienced in instructing and passengers. Desires change. Will go anywhere. AERO DIGEST, Box 1691.

YOUNG MAN: 26, Air Corps Technical School graduate airplane mechanic, parachute rigger. 1½ years school; 2½ years experience. Permanence, future desired. AERO DIGEST, Box 1694.

REWARD: Transport pilot, mechanic, will pay half month's salary for information leading to steady employment, living wage. 710 hours, day, night, wheels, skiis, all weather. Experienced instruction, cross country, power line patrol. Excellent record. Age 26, married. Pilot, Marquette, Kansas.

TRANSPORT PILOT with 6-place ship in perfect condition and sales ability, desires position with reliable company or airport. Years of experience; go anywhere. AERO DIGEST, Box 1696.

TRANSPORT PILOT: 37; 3,000 hours; ex-air mail. Chief instructor and director. Airport manager. Demonstration and sales. Go anywhere for $150 per month. Reference. Aviator, New Dublin Hotel, Dublin, Georgia.

TRANSPORT PILOT: A and E mechanic, age 23. 400 hours flying time, experienced student instruction, cross country flying, rebuilding of airplanes. AERO DIGEST, Box 1706.

Wanted To Buy Or Trade

WANTED: Stinson Reliant. Give complete description and lowest cash price. Address AERO DIGEST, Box 1692.

WANTED: Waco F wings, Great Lakes wings and motor cowling, Waco 10 J-5 cowling, OX-5 Waco cowling, Fleet wings. Manager, Richards Field, Raytown, Missouri.

WANTED: New Standard J-5, Waco 9, and Edo floats No. 3830. No junk considered. Give full description with photograph, first letter. J. C. Sanders, Centerville, Tennessee.

WANTED: Used ship or one that can be repaired. Fred Vilsmeier, 857 East Luzerne Street, Philadelphia, Pennsylvania.

WILL TRADE: Driggs Skylark, biplane, Rover motor; 100 hours since major; ship recovered last spring; finished red and cream; licensed August 15, 1934. Want three or four-place. Will pay cash difference. J. H. Brehm, 504 Harrison Ave., Calumet City, Illinois.

WILL BUY: Transport pilot has up to $1,000 cash for licensed three- or four-place radial ship. Full description and lowest price in first letter. AERO DIGEST, Box 1700.

EDO FLOATS WANTED: Used, all sizes. Write, giving all details, size, condition, date manufactured, ship used on, lowest cash price, etc. Dan Henry, 8504-151 St., Jamaica, New York.

TRADE NEW PLYMOUTH coupe for Challenger Robin or what have you? A. J. Hartman Airport, Burlington, Iowa.

WANTED: Curtiss Robin Challenger or J6-5, or similar ship. Give full details, best cash price first letter. Thomas Karren, Box 420, Vernal, Utah.

TRADE BBT FLOODLIGHT, TP Swallow for three-place open air-cooled ship. Will sell. Harry Lee, Station D, R. F. D. No. 4, Columbus, Ohio.

WANTED: J-6, J-5, Lycoming, Warner, Lambert motors and parts. Any condition. Also pair of Edo 3300 or DeLuxe floats. Give complete description, prices in first letter. AERO DIGEST, Box 1705.

USED STINSON or similar ship wanted. Radio and starter equipped preferably. Would consider crack-up if priced right, or could trade licensed ship for same. Want to trade approved repair station work for J-4 or -5 and steel prop for same. J. B. Sanders, Center, Texas.

HAVE BRAND NEW Challenger and Standard Steel variable pitch propeller. Want ship designed for above or will trade for ship with good performance. George Scott, Milldale, Connecticut.

WANTED: Curtiss-Wright Jr., Aeronca Collegian or similar types. Must be licensed and in good condition. Cash for bargain. Claud Richardson, 89 D St., N.W., Linton, Indiana.

HAVE FOR TRADE Pitcairn, new cover, new prop, motor recently overhauled. OX-5 turns up 1400 on ground. What do you offer? Prefer 2-place Aeronca. Watson S. Eaddy, Johnsonville, South Carolina.

WANTED: Airplane, any condition, less motor, with factory engine mount for J6-5. Also steel propeller for same. Give complete details. AERO DIGEST, Box 1702.

WANTED: Liberty motored Douglas or Falcon mail plane, also parts for same. Answer completely, giving condition, price and location. AERO DIGEST, Box 1703.

HAVE CASH for modern planes up to 300 h.p., open or closed; any condition. Give details and price in first letter. AERO DIGEST, Box 1704.

WANTED: Kinner K-5, front exhaust, new or slightly used. Also, air wheels, 22 x 10-4, 850 x 10; bank and turns, rates of climb. Yankee Aero Parts, New Canaan, Connecticut.

ATTENTION PLANE OWNERS: Cash for late cabin and open ships, also Warner motors. What have you? We buy, sell and trade. Write for list of bargains.. Omaha Aircraft Brokerage Service, South Omaha, Nebraska.

WANTED: Right upper wing and center section, for Travel Air 4000-E or -D. Cheap for cash. Charles F. West, Teterboro Airport, Hasbrouck Heights, New Jersey.

WANTED: 1931 or later model Great Lakes. Submit lowest cash price. Standard Aviation, Inc., Teterboro Airport, Hasbrouck Heights, N. J. Telephone: Hasbrouck Heights 8-0202.

CASH UP TO $700 for licensed Fleet, Waco F, KR-21 or similar type. Ship must be in A-1 condition. Give all details. AERO DIGEST, Box 1709.

EDO FLOATS No. 3830 for Ryan B-5. Must be reasonable; good condition. Will pay cash. Earl F. Crabb, Forestry Department, State House, Augusta, Maine.

WANTED: Great Lakes or similar ship, less Cirrus motor. Cash price. Fabric no object. D. P. Kelley, Marine City, Michigan.

WANTED: Robin wing, left, licenseable; uncovered preferred. Russell Metzger, Canal Winchester, Ohio.

WANTED: Lockheed Vega or Sirius. Consider slight damage. Must be reasonable. No dealers. J. K., 2043 Spring Garden St., Philadelphia, Pennsylvania.

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GAINING

This issue of AERO DIGEST carries 38½ pages advertising—a *gain* of 7 5/6 pages over the last issue; and a *gain* of 6 5/6 pages over February, 1933.

The January, 1934, issue of AERO DIGEST which carried 30 2/3 pages of advertising, showed a *gain* of 1 2/3 pages over January, 1933.

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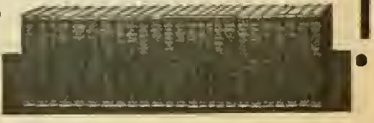

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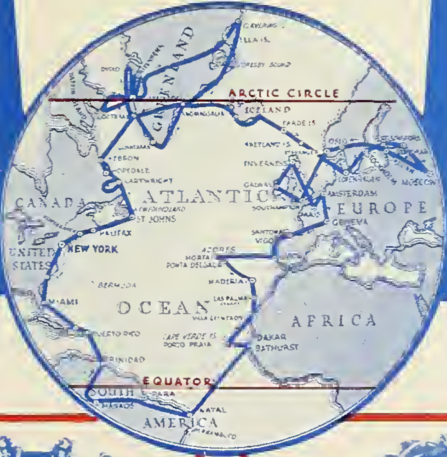

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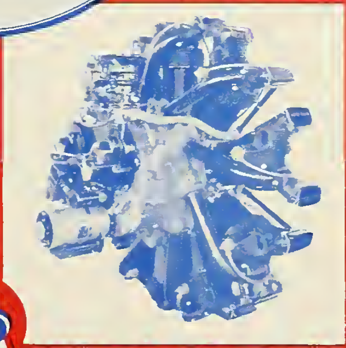

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AERO DIGEST, *March, 1934* *Volume 24. Number 3.*

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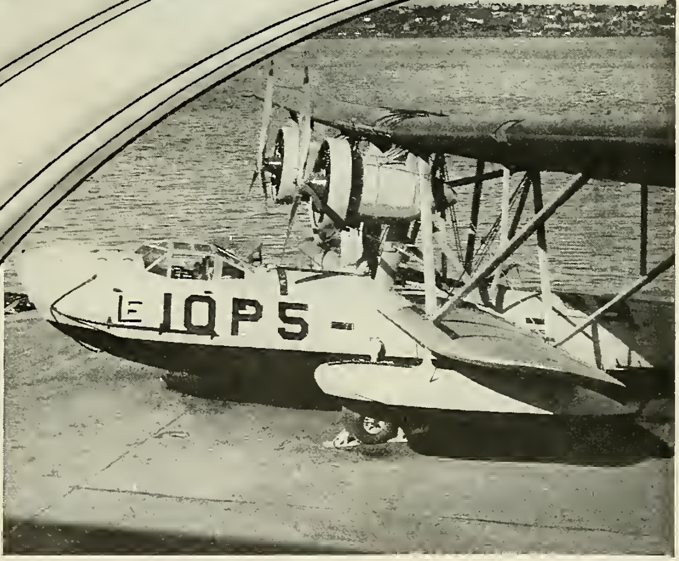

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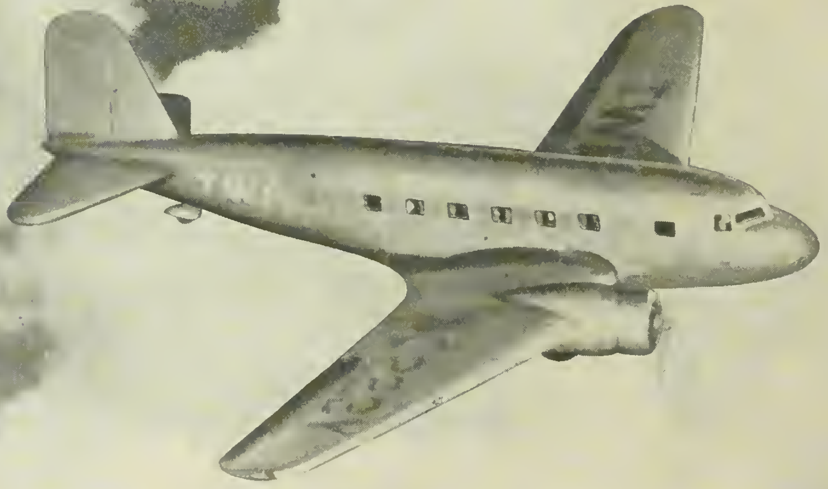

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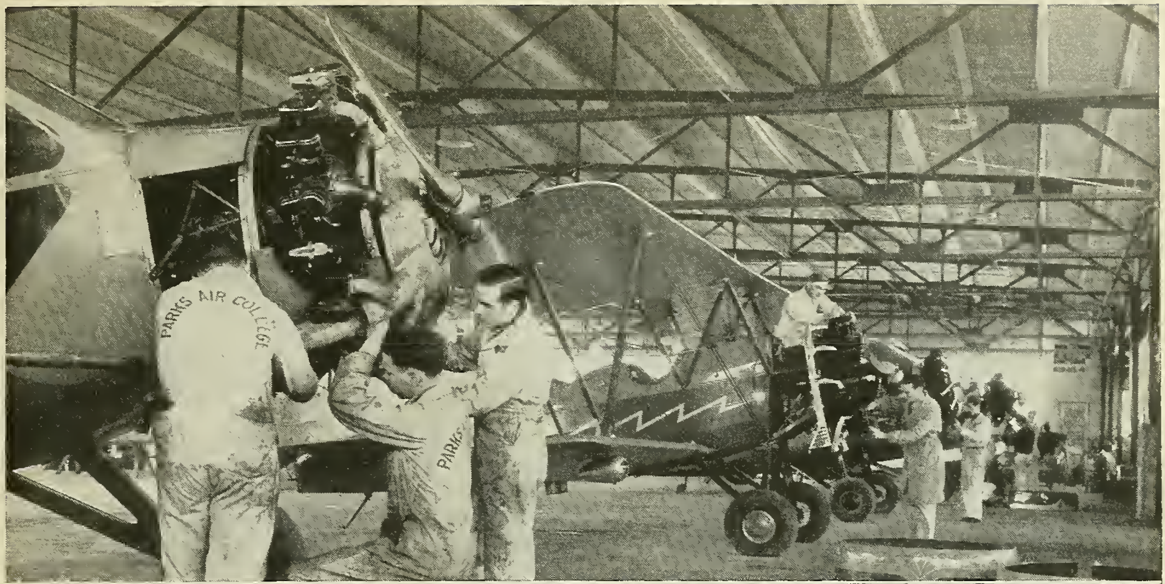

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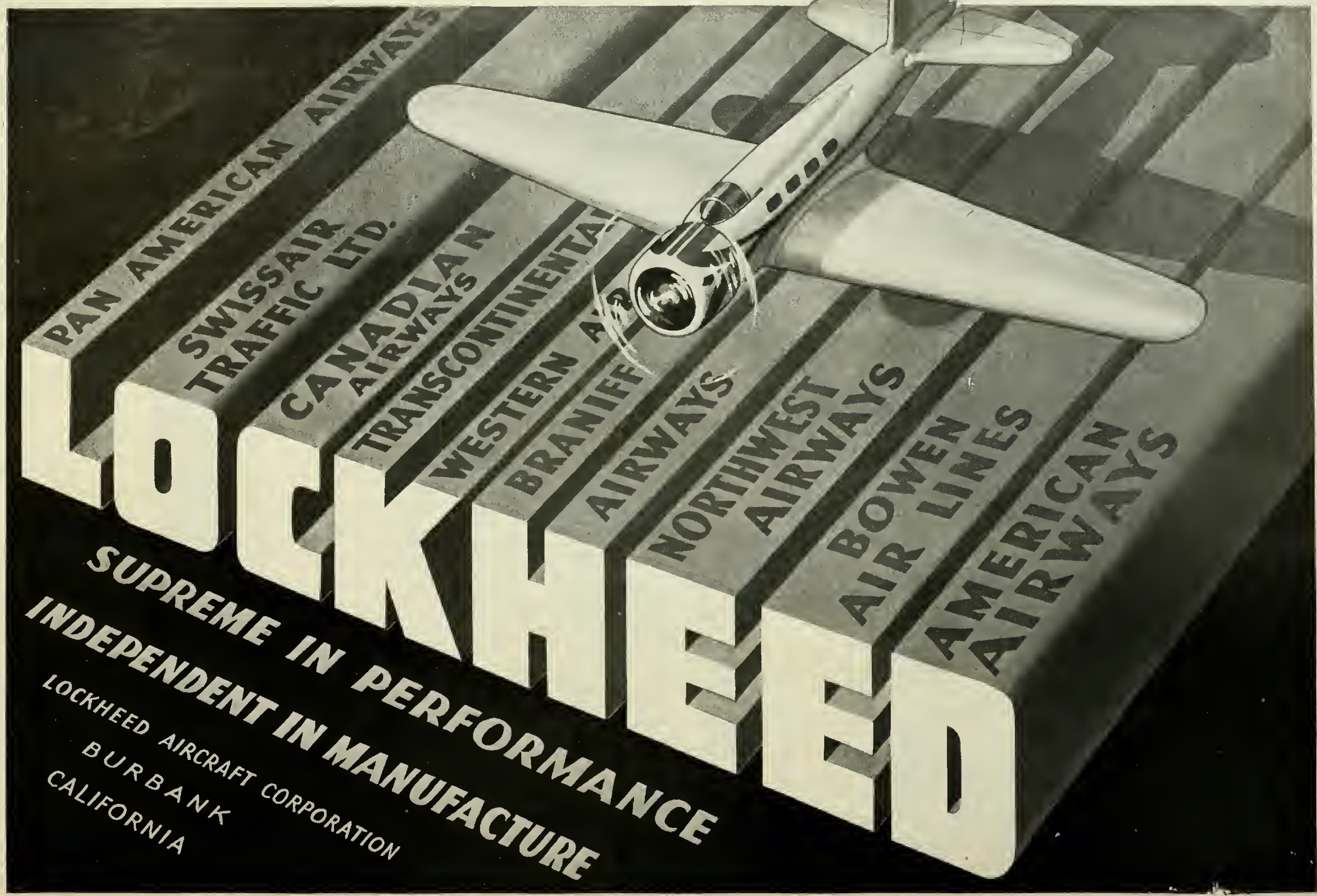

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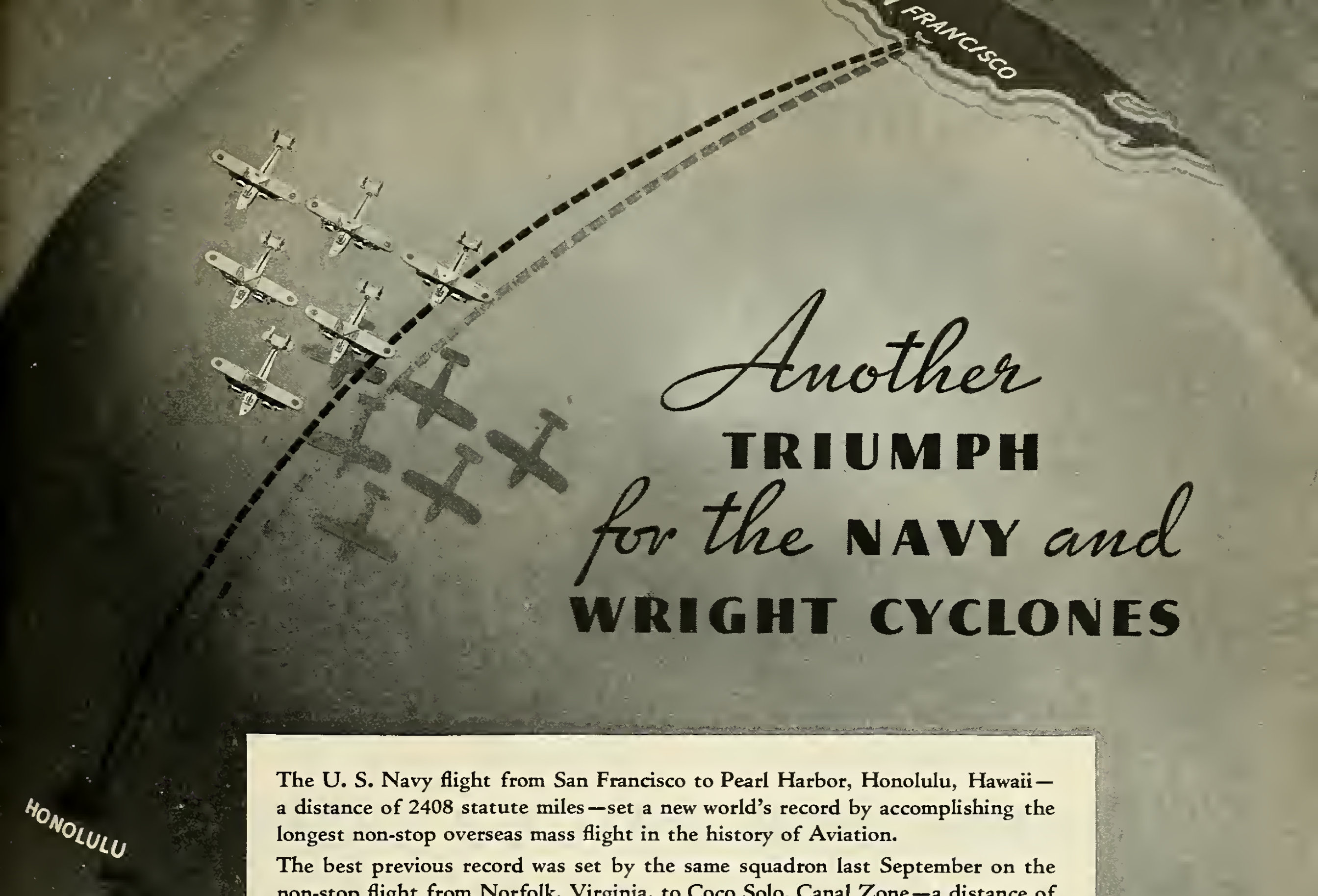

Another TRIUMPH *for the* NAVY *and* WRIGHT CYCLONES

The U. S. Navy flight from San Francisco to Pearl Harbor, Honolulu, Hawaii—a distance of 2408 statute miles—set a new world's record by accomplishing the longest non-stop overseas mass flight in the history of Aviation.

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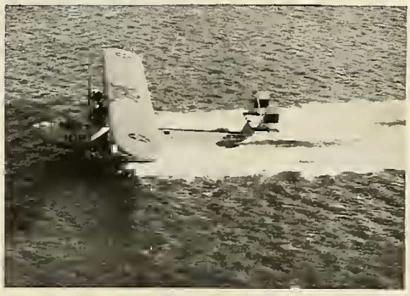

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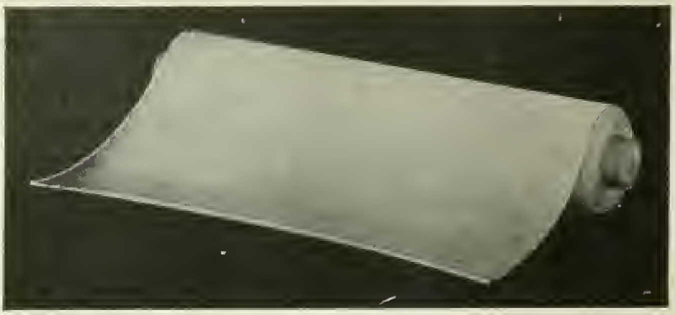

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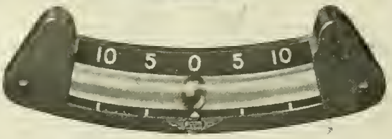

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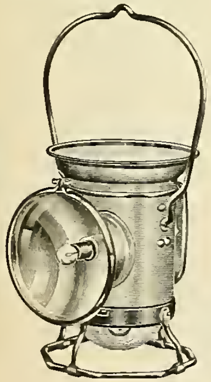

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Maynard Marsch	Marietta, Ohio
William A. Stephens	Durham, N. C.
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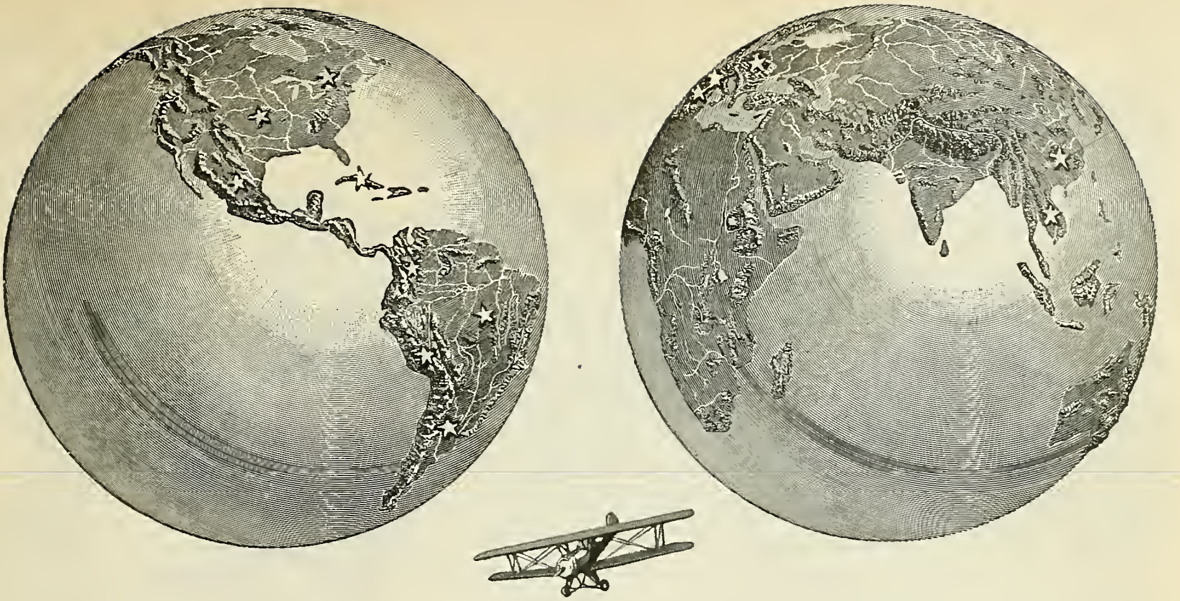

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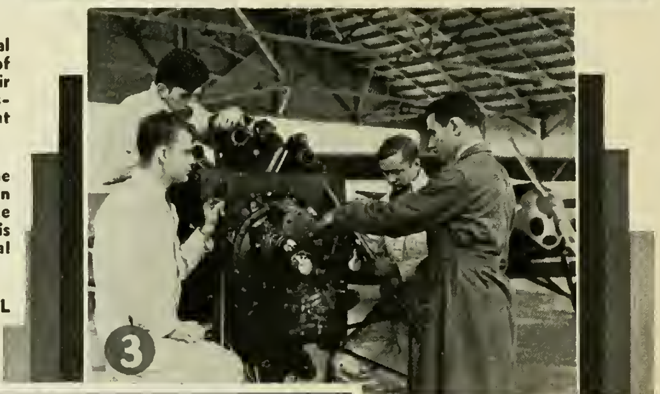

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KEY TO PICTURES

(1) Great Lakes plane from Ryan School—over San Diego.
(2) Ryan students enjoy amphibian training on San Diego Bay.
(3) Motor instruction in Ryan Shops.
(4) A wide variety of planes in the spacious Ryan hangar.

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KEY TO PICTURES

(5) Ryan classroom scene, Feb. 16, 1934.
(6) Night flying by Ryan students—from Lindbergh Field.
(7) Ryan Brougham—one of the cabin planes used for student instruction.
(8) Ryan shops give extensive practical experience.
(9) Aircraft welding is a part of Ryan shop training.

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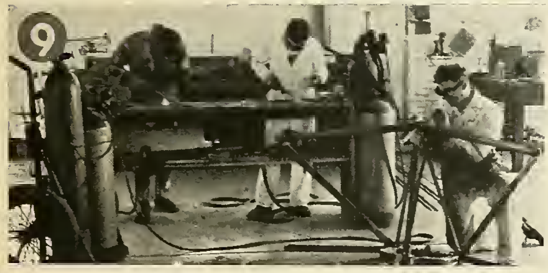

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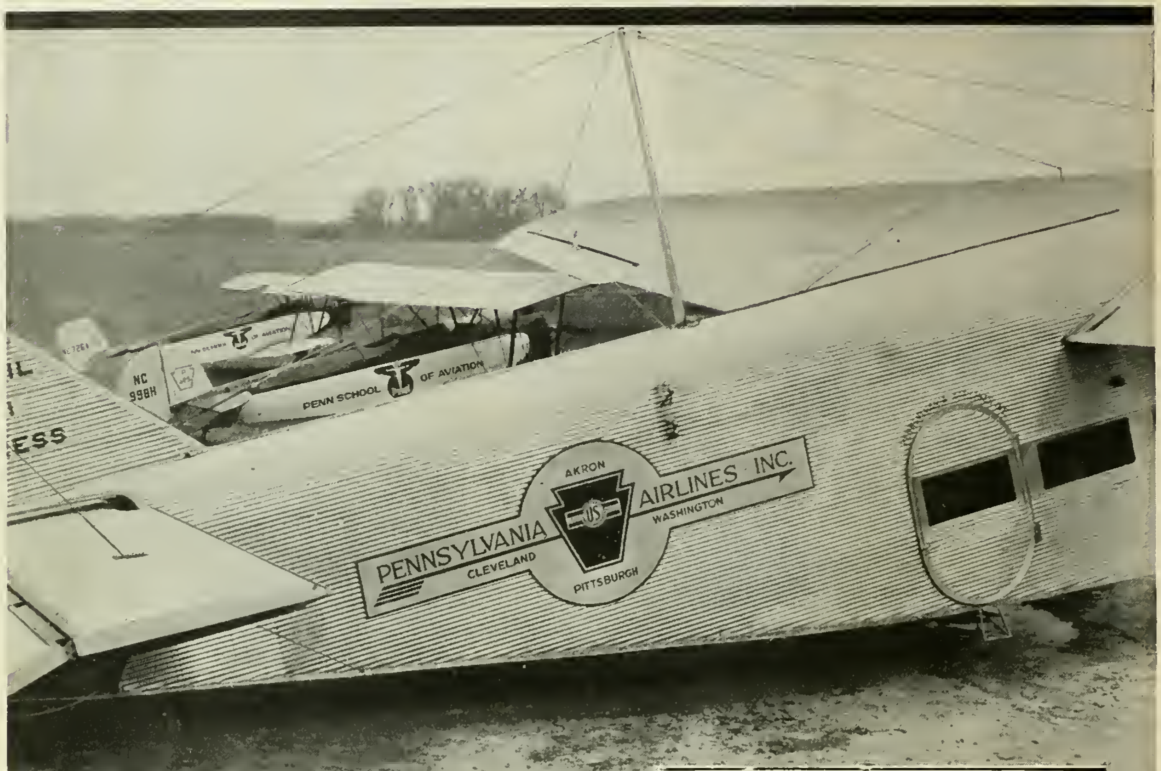

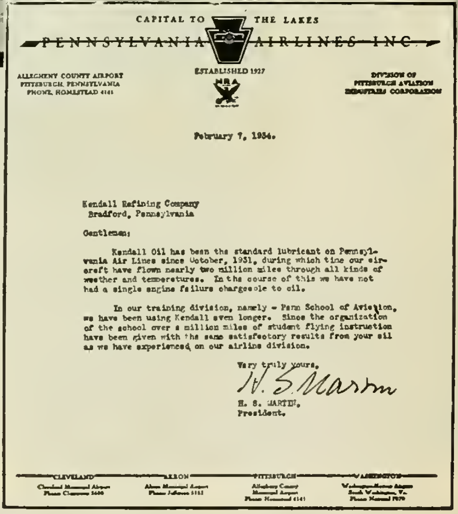

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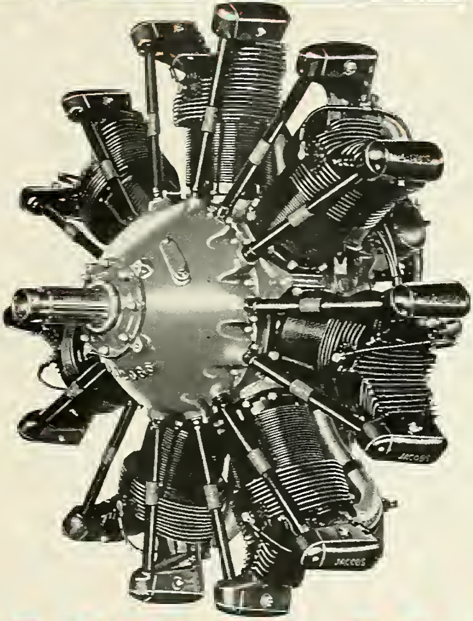

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AERO DIGEST

VOLUME TWENTY-FOUR NUMBER THREE

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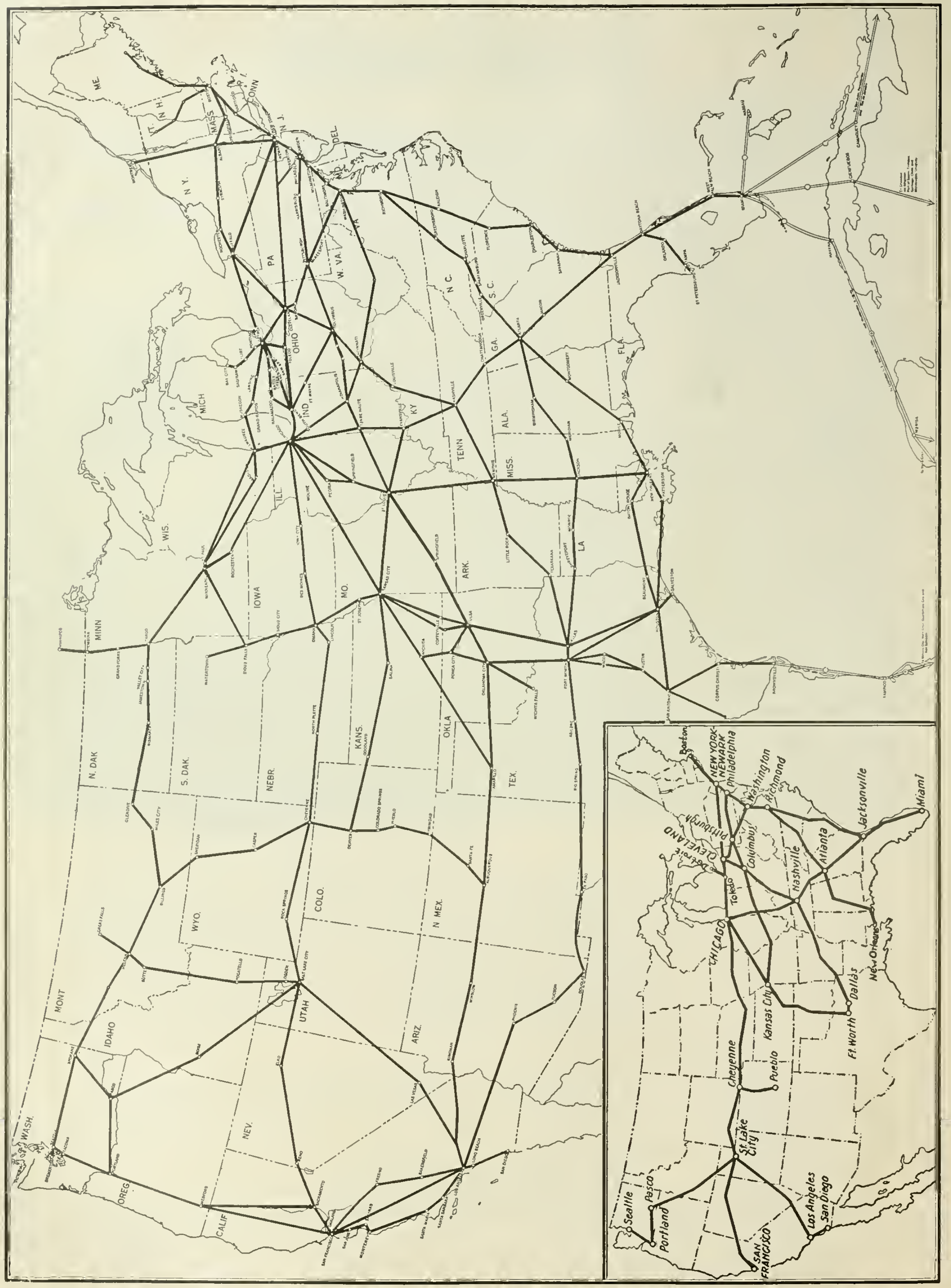


Maps showing recent airlines of the United States compared with air mail routes operated by the Army Air Corps beginning February 19th

AIR
Hot and Otherwise

●

FRANK A. TICHENOR

● Last April, in the first spring of the New Deal, when the American people, both the high and the lowly, were in the throes of economic ecstacy over a change in their government, when there was very little to be happy over except that there had been *a change*—nothing else—Aero Digest paused to inquire what this new deal could and might mean to the industry which it serves and represents, and wrote (you'll find it on page 16 of the April issue) as follows:

"However, enthusiasm of our leaders alone can not be counted upon unless American commercial aviation is prepared to give definite proof of its ability to carry the task which has been assigned to it. Spokesmen for the industry are rather fond of citing the historical fact that American civilian aviation developed so rapidly after the war that the Government, after establishing air mail through the use of army equipment, after a short period of time was able to turn this work over to the commercial companies under contract.

"A fact, however, of which they seem to lose sight is that the process might easily be reversed. The idea is not as far-fetched as it may seem. There is little in the existing set-up which would prevent the immediate return of air mail carrying to army fliers. . . ."

A Devastating Change

And now in the second spring, when there does not at the moment appear to be quite so much jubilation in our industry, that predicted possibility has become an accomplished fact. The devastating change, we are told, was necessitated purely and simply by the manner and method of the making of the government contracts. The New Deal, so-called, has swept into the discard those government officials who were representatives of the people in the making of the contracts.

If government employees and advisers were participants in what is now objected to, it would seem altogether fitting and proper to inquire into the motives, reasons and capabilities of those now responsible for the nation's present aviation policy.

It is not surprising that the most astute political observers at Washington are frankly speculating today on whether the Administration's handling of the air mail situation may not prove the undoing of the New Deal and the cause of the first active and outspoken opposition of the entire administration. It is not surprising that this should be so. We may pass over the high-handed manner in which all contracts were summarily cancelled without right or benefit of hearing by the accused; we will pass over here the hasty turning over of the task of air mail carrying to the Army, which was improperly equipped to do the job, with such regrettable results as to cause an immediate emotional reaction by the American people and we will for the moment ignore the discourteous way in which the communication of protest of the industry's most popular and outstanding spokesman was treated at the White House in order to inquire who were the President's advisers in this treacherous act.

The Chief Executive has frequently been hailed here and elsewhere as a figure sympathetic and understanding to aviation; it therefore becomes the more surprising that he should have received and accepted advice on such a technically delicate problem as concerns our industry from politically- (but non-technically-) minded persons.

An unexplored and incompletely defended charge that air mail contracts were drawn and let illegally without a hearing of all the operators involved was approved as justification for summarily cancelling all contracts. The first legal protest in the courts against such action drove the Administration's case all the way back to that extremely weak last line of defense that no redress could be sought until such time or times as the government gave its consent to be sued! Certainly the legal advice, wherever it came from, for the opening move, was not of the best.

Whose Advice Was Followed?

Such being the case it might be advisable to inquire into the motives and reasons and even the ability of the men around the President who sought and did advise him upon what now seems one of the most disastrous and ill-advised moves in the year-old administration.

Certainly first and foremost among these titans of aeronautical thought stands James A. Farley. Late last summer, after what was a display of commendable patience on the part of the aeronautical industry, inquiry was made of Mr. Farley as to what was to be his long promised policy concerning aeronautics. In due course Mr. Farley replied, "The future of American aviation has been taken under advisement."

Commenting on that lackadaisical attitude by the Postmaster General, Aero Digest said last November, "The record of the industry is sufficiently clear to leave little doubt as to the course which should be followed. Its record through the past four years indicates that the fundamental concepts of the Watres Act do not need radical changing at this time."

Farley, Black, et al

Mr. Farley, however, was too busy at the time in efforts to prevent the world's largest city from escaping from Tammany graft and from getting a new deal in government to pay much attention to his duties in the Post Office Department. Passing on from his timely defeat in New York City, Mr. Farley traveled hither and yon on politics bent and obviously in the course of his travels saw the political football possibilities inherent in tearing down the air mail carrying structure of the nation. Not reform, not gradual change, not the legal elimination of the guilty was the plan which he evolved, but a wholesale redistribution of contract favors under the direction of the "right party" was the objective sought. Excepting his wisdom on the subject of politics, Mr. Farley has little to contribute in the way of advice on what the aeronautics policy should be.

While it is true that Mr. Farley was out of Washington much of the time and therefore not available to give his valuable advice to the President, there was available Mr. Gene Vidal. It certainly is regrettable that this source of technical and specialized knowledge, if it were called upon, was most recently gained in airline operation which had never carried air mail.

In the meantime, the Administration's principal activity in laying the foundation of a new aviation policy was in charge of that sterling authority on aviation, Hugo Lafayette Black, the Senior Senator from Alabama. Senator Black is a lawyer by profession, a Senator by political ambition, and presumably myopic and dyspetic toward aviation as a result of being in the field artillery dur-

(*Continued on page 72*)

EDITORIALS

> "I believe that much of the wonderful system we have built over a period of years will be destroyed if the administration continues its persecution of those responsible for operating our present airways system. The Senate Committee seems more interested in bringing discredit on those who are operating the airlines than it is in establishing justice."—HAROLD F. PITCAIRN.

Build Up Our Air Reserves!

● Representative James McSwain, Chairman of the House Military Affairs Committee, recently introduced a measure intended to build up our military flying personnel through the Army Air Corps Reserve. The proposed plan, which apparently is frowned upon by the General Staff, would be one of the most economical methods of supplementing our first line of defense.

One argument raised against the plan is that it would create a still greater number of already qualified, but unemployed, pilots "floating around the country." It is to the shame of an enlightened nation that the services of these men are not directed in channels which would make them immediately useful in time of impending war. Their education in flying in many cases cost them, and the government, dearly. Loss of their services now is a distinct loss to the country which needed pilots so desperately sixteen years ago.

When the United States entered the World War in 1917 among the first units ready for the front were pilots trained by the Air Divisions of the National Guard and by college groups. The specialized ability of these men, drawn from civilian endeavors was eagerly commandeered by our undermanned military services. The splendid war records of these men were an inspiration to those who soon followed in their flight paths.

Any plan which will furnish us a substantial nucleus of trained airmen who can be called upon suddenly in time of national stress, deserves unqualified support. To feel that it is a liability to have trained pilots scattered in all parts of our country is a short-sighted viewpoint which admirably serves to give encouragement to any nation contemplating hostilities with us. Trained airmen must always be available in peace-time, and long before hostilities commence.

Sad experience showed that during time of war men cannot be properly trained in time to be of immediate value; it required about eight months to instruct pilots for military flying in the World War, and records show that American pilots were trained quicker than those of other allied countries. When war comes our salvation will lie in prompt, effective and extensive aerial defense. Delay at the beginning will prove costly and no further proof of this is needed than the record of chaotic, frantic, expensive last-minute attempts to catch up on military flight training when we became engaged in the World War.

Patriotic and competent men in every State in the Union are ready and anxious to learn to fly or to keep in flying trim, and it is no mere concession but a solemn duty to the nation to provide adequate funds and proper facilities to enable them to do so with as little delay as possible.

Possibilities of Feeder Airlines

● Future development of the air transport industry in the United States will undoubtedly come in the creation of feeder lines, for, with transcontinental airlines now bridging the country through its center, in the north and in the south there is little room for further expansion along the coast-to-coast routes. Whatever expansion will come, will be in the nature of relatively short flights off the established routes to those cities which, because of their geographical, industrial or political importance, must connect with those lines now flying across the country.

An appraisal of the airline map of the United States reveals the fact that only 191 cities are today on one or more lines, leaving a great number still bereft of this newest and most expeditious of transport services. Some states are without airline service at all while capital cities of other states, municipalities with large populations and great industrial centers have yet to experience their initial scheduled service by air.

Despite this, over a half a million passengers were flown by domestic companies during 1933, a figure which surpasses previous marks with much to spare. No great stretch of the imagination is necessary to foresee what the opening of these feeder lines will mean in increased mail, passenger and express revenue. Vast potential sources of income in the form of airline traffic have been left untouched while existing transport companies were busily engaged in efforts to improve their routes to the point where nothing remained to hinder progress, safety or dependability. Now that this pioneering work has to a large measure been completed, attention should be diverted to spreading the airline net around the entire country.

With supervision by the Aeronautics Branch of the Department of Commerce, a safe and dependable operation will be forthcoming, regardless of who or what company flies the feeder lines.

Opening of feeder lines presents another outlet for the engineering genius who, for sometime has, to a great measure, been confined to the development of large transports and small, fast military aircraft. Some special airplane, smaller perhaps, than the transcontinental airliner, will be needed to perform the service peculiar to short flight operations.

An aid to the development of the feeder lines exists in the great number of airports now being built with government, municipal and state funds. The impediment that once presented itself on that score is now being gradually eliminated. In addition, numerous cities, previously hindered by inadequate and small fields, now find themselves with the financial backing to build such improvements that will invite and maintain regularly scheduled airline service.

Cutting More Red Tape

● The new Inter-Departmental Advisory Committee on Aviation, originally conceived by Secretary Roper, is a good example of what the government should do to foster development of aviation.

This group will attempt to formulate a uniform federal aviation policy aiming at greater coordinating efficiency in the promotion and fostering of all forms of commercial, private and military flying. This is an encouraging program. If carried out according to promises, many of the PWA aviation projects, now retarded by personal and departmental prejudices, should be untangled from the maze of red tape which keeps them inactive and impotent.

Aviation should benefit immeasurably as a result of the studies of this group. We hope, however, that in its desire to create the best conditions in the industry, the committee is not led into the promulgation of many rules and regulations which would hamper the development of aviation and at some future date act as a boomerang to the industry's advancement. Progressive and intelligent indulgence on the part of those entrusted with the workings of this committee will forestall any such possibility.

Pittsburgh Aviation Industries Corp.

THE FOURTH OF A SERIES OF FEATURE ARTICLES RELATING TO THE MAJOR AERONAUTICAL ORGANIZATIONS OF THE UNITED STATES—THEIR HISTORICAL DEVELOPMENT, SCOPE OF ACTIVITIES AND EXECUTIVE PERSONNEL

H. S. Martin

C. B. Monro

W. J. Austin

G. R. Hann

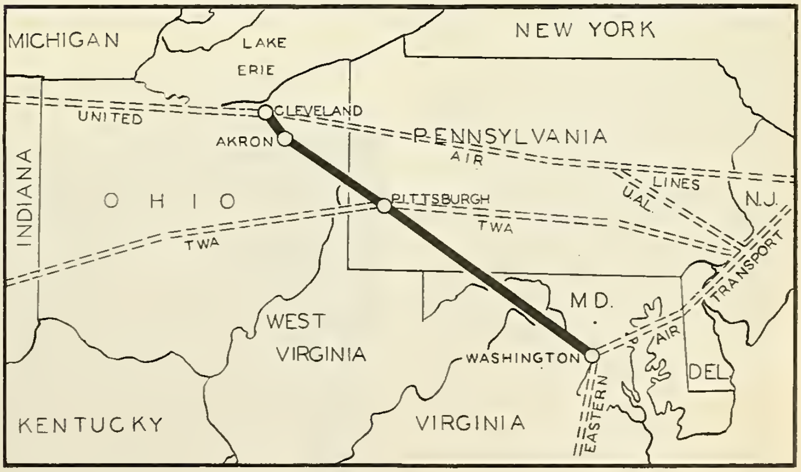
G. S. Davison

A. C. Humphrey

● For a complete understanding of the composition and activities of Pennsylvania Air Lines, which operates Penn School of Aviation and the Pittsburgh-Butler Airport, it is first necessary to trace the history, aims and ideals of the Pittsburgh Aviation Industries Corporation of which company Pennsylvania Air Lines is an outgrowth.

Pittsburgh Aviation Industries Corporation was organized in 1928 after months of effort on the part of a group of civic-minded Pittsburghers to make their city an aviation center. Their program included the acquisition for the city of a place on the air mail map which its importance as an industrial center justified, and the development of such allied aviation activities as would benefit the district. From the outset, it was a community enterprise, with few, if any, dividend possibilities for many years. Sufficient funds to cover the development of an organization in which the city could take pride, were, therefore, at first difficult to raise. Finally, however, more than 200 of the leading business men and business houses subscribed a sum in excess of one million dollars for the project, with the understanding that this (and more, if necessary) was to be used in providing Pittsburgh with an airport, an aviation school, and varied other aviation activities unexcelled anywhere in the country.

The organization meeting of the stockholders was held December, 1928, at which time a directorate numbering 58 of Pittsburgh's leading citizens was elected under the chairmanship of George S. Davison. George R. Hann, one of the leaders in the movement for the formation of the company and prominent in aviation circles, was elected president, Richard W. Robbins, Norman Allderdice, T. J. Hilliard, vice-presidents, and C. Bedell Monro, secretary. Subsequently, Major H. S. Martin, who had held po-



Map showing route and airline connections of Pennsylvania Air Lines

A hangar classroom lecture on the subject of engine and flight theory, etc.

sitions in the Army as Chief Engineer, Chief, Procurement Section, and Chief, Field Service Section (what is now known as the Materiel Division) in addition to being in complete charge, together with Colonel Thurman H. Bayne, of Aircraft and Engine Production during the war, so far as military service was charged with the duty, was elected vice-president in charge of operations and technical matters.

The first step taken by the company was to secure the services of an expert technical staff, consisting of men with long experience either as pilots or aeronautical engineers, most of whom had received their training in the U. S. Army Air Corps. Their preliminary duty was to select an adequate base for flying activities. The survey of this group covered the entire Pittsburgh district, and it was finally decided to locate an airport north of the city. Approximately 640 acres of land were acquired, the field cleared and all necessary grading done to secure an A-1-A rating. Two modern brick and steel hangars were constructed, and other buildings available on the property were remodeled to supply an administration building, restaurant and student barracks.

Although there were some woods in the vicinity of the field, these were cleared so that they offered little or no obstruction to landing aircraft. Complete lighting equipment was installed, including a twenty-four inch rotating beacon of eight million candlepower, boundary lights, flood lights for landing, a ceiling projector, and the buildings were floodlighted.

In the hangar and shops equipment was installed for repair and overhaul work, in addition to the necessary personnel, and servicing crews to provide gasoline and oil for visiting aircraft. Marker arrows were placed on the roofs of surrounding buildings and the airport was identified by the name, Pittsburgh-Butler Airport, on the roof of Hangar Number 2.

The total cost of this project, which resulted in one of the largest and best-equipped airports in the country, now known as the Pittsburgh-Butler Airport, was slightly in excess of $500,000.

On completion of the airport, various aviation activities were instituted, such as charter work, the establishment of Penn School of Aviation for flying, ground and mechanics training, the building up of an aerial photograph and survey business, sales of aircraft engines and accessories, and the conducting of maintenance and overhaul work.

These various activities were carried out by subsidiaries of the parent company; namely, Pittsburgh Air Transport Corporation, Pittsburgh Aviation Management Corporation, Pittsburgh Aviation Securities Corporation, Pittsburgh Aerial Surveys Corporation and Pittsburgh Aircraft Agency.

After a few months of operation, it became apparent that school activities offered the greatest possibilities for development and accordingly the charter, sales, service, photography and survey work handled by the subsidiary companies were absorbed into Penn School. Furthermore, efforts were concentrated upon building up this division to the point where it would be regarded as one of the leading aeronautical training centers in the United States.

Situated at the junction of the Ohio plains and the foothills of the Allegheny mountains, Penn School is particularly fortunate in its location, for every conceivable kind of terrain and weather can be studied at first hand. At the same time, the climate is temperate and there are only a few days during the year which might be described as "unflyable."

Today, the school operates two divisions; one at the Allegheny County Municipal Airport and the other at the Pittsburgh-Butler Airport. Both are fully approved by the Department of Commerce for private, limited commercial and transport flying and ground instruction. The same type of equipment and methods of instruction are used at both locations.

These two airports are among the finest in the country. The former was constructed by the City of Pittsburgh and the County of Allegheny at a cost of four million dollars; the latter, owned jointly by Transcontinental and Western Air, Inc., and Pennsylvania Air Lines, is most active in aircraft overhaul and repair work.

At both divisions there are special classrooms in the modern hangars designed for the comfortable accommodation of 20 students. The hangars themselves are of brick and steel construction, heated, ventilated, and have a total floor space of 50,000 square feet. The facilities provided are complete with individual shops for aircraft, engine, wood, fabric and dope work, in addition to the stock room, parachute packing shafts, and lecture halls.

Students receive training based upon the methods used by the United States Army and Navy, acknowledged to be the best in the world. Some adaptations have been made to provide better training for

A Pennsylvania Air Lines plane being serviced at Cleveland Maintenance Base.

commercial and private flying, but these have all been of a progressive nature to better fit graduates for the positions which they will afterwards occupy. The keynote, however, of Penn School of Aviation training is individual instruction.

The staff of licensed instructors at Penn School are men of the highest moral character, selected not only for their outstanding ability as pilots and mechanics, but also for their ability to impart knowledge to others. Each one has undergone and successfully passed a rigid examination by the Department of Commerce on the subject which he teaches.

The latest and most carefully tested airplanes are used, and no obsolete or single-ignition engines are in service. Radial engines, ranging from 100 to 420 horsepower are the exclusive power-plants in Penn School training planes. The planes themselves range from two-place trainers to large ten-passenger, tri-motored cabin planes.

Scheduled airline regulations are enforced in the maintenance of this equipment. Airplanes and engines are carefully examined daily, in addition to inspections after each flight. They also receive a thorough inspection after every 20 hours in the air. At regular intervals every airplane is completely overhauled and rebuilt, while the engines are completely overhauled after every 300 hours running time. These overhauls cover every part of the airplane and engine, and any portion showing wear is replaced.

A large assortment of airplanes, instruments, engines, magnetos, carburetors and other parts are kept on hand for students to work upon. In addition, the overhaul and repair shops at the Pittsburgh-Butler Airport, Allegheny Country Airport, and the Cleveland maintenance base of Pennsylvania Air Lines are always open to the students so that they may observe the practical phases of the air transport industry.

While taking flying instruction students are required to wear parachutes. Although the standards of maintenance adhered to by Penn School render this precaution virtually unnecessary, everything is done to assure the student's safety and welfare.

Studying the fabrication of tubular steel used for the fuselage and tail surfaces

Penn School of Aviation in its curriculum has attempted to design its various courses around the requirements which will be demanded of its graduates. In doing this it has been greatly helped by its operation as a division of Pennsylvania Air Lines, Inc., and by its close affiliations with Transcontinental and Western Air, Inc.

The two training bases, one an air mail and passenger terminal for two airlines, and the other an overhaul and repair base, are an important factor in the "Design for Training," since a student immediately upon enrollment is automatically thrown into direct association with the ideas and personnel of successful operating units. In such manner, by almost unconscious absorption, he becomes familiar with the operation, routine practices and policies of organizations similar to those with which he is fitted to take his place upon graduation.

Aircraft engines of various types are employed for classroom demonstration

When a student applies for enrollment in Penn School his case is analyzed in order to ascertain the particular type of training which will fit him for the branch of aviation that interests him most—flying, operations, traffic, etc. He is then assigned to one of the School's divisions or possibly to each in turn for a certain period and started upon the course deemed best fitted to his needs. It has been found that highly individualized instruction is superior to other methods in turning out qualified men.

An average Master Pilot's Course, since it covers the largest number of subjects, offers the best example of the general practice followed by Penn School.

Upon enrollment the student is assigned to the Allegheny County Division for preliminary flying and ground instruction. The airport is ideally suited to the needs of a beginner since it is entirely hard-surfaced, and all approaches are free from obstructions. Here he is given his first air work in Kinner-powered Fleet training planes, learning the elementary technique of flying. Each lesson lasts approximately 45 minutes, the first 10 minutes being devoted to going over with the instructors the maneuvers to be covered. Then follows 15 to 20 minutes of flying and then a further 10 or 15 minutes on the ground while difficulties and faults which have occurred are reviewed and explained.

Concurrently with flying lessons, the student attends classes in ground school subjects of a general character, such as Air Commerce Rules and Regulations, theory of flight, and aircraft and engine structure. As a student progresses, more advanced subjects are taken up: navigation, meteorology, instruments, etc.

Three or four months usually suffice for this stage of training, during which time the student has acquired some 50 hours in the air and has secured a limited commercial license. Ever more important, however, is the fact that he has familiarized himself with many of the problems and practices of aircraft operation on a large scale. Between classes and flying lessons he has had the opportunity of studying the manner in which airliners are serviced, the precautions necessary to take against static electricity and fire, and the handling and storage of gasoline in bulk. He has watched the loading of passengers and handling of mail, familiarized himself with ship clearances and load manifests. In the Operations Office of Pennsylvania Air Lines are the Department of Commerce teletypes with the weather reports and private wires carrying messages in the Air Traffic Conference Code.

These things become part of his everyday life. In addition, through association and contact, he has gained a practical knowledge of many current aeronautical practices.

For the next phase of the course the embryo Master Pilot is transferred to the Pittsburgh-Butler Airport, which is even larger than the Allegheny County Airport. Here he spends another nine months of intensive instruction, putting in a further 300 hours of flying to bring his total up to 350 hours, the time generally assigned for this course.

At every stage in the training, close personal supervision is maintained on the students' work and emphasis is laid upon precision in all maneuvers and sane conduct in the air. At no time is deviation from the strictest standards in the handling of planes allowed, with the result that long before the hundred-hour mark is past the student has learned to control the ship smoothly and easily, with absolute ability to negotiate landings in small fields or to cope with unexpected occurrences. After he becomes familiar with the lighter primary training planes he is taught to fly heavier types of open planes and large single-engined cabin craft. Then comes cross-country instruction and solo flights, while at the same time past lessons are continually reviewed and practiced.

When the student has become proficient in all forms of daylight flying, instruction begins on night flying. At first this is done entirely in the vicinity of the airport and consists primarily of learning to land and take-off, to familiarize himself with the changed conditions of piloting. After some 15 hours of this practice the average student is ready for night cross-country training which is so essential to an airline pilot. First flights are dual, but after two or three of these and with the background of many daylight cross-country trips, solo night flights present few difficulties. Regular lighted airways are used in order that the student may accustom himself to the use of beacons and other aids which will serve him later.

Instrument flying and tri-motor experience must also be taught before the near-graduate can be considered as acceptable airline material. These two phases of training comprise the final stages of the flying course.

Blind flying instruction occupies between 15 and 20 hours and is the same course which was given by the School to the pilots of Pennsylvania Air Lines when it became necessary for them to take a Department of Commerce examination on instrument flying to secure Air Transport Pilot ratings. So successful was the method employed that it has been maintained *in toto* in the curriculum. Both open and cabin types of planes are used and the student must become equally expert in each before he is to graduate.

Dual and solo tri-motor time are given in Stinsons. The course provides for sufficient flying on this equipment to enable the student to secure a tri-motor rating, but additional practice can be had if desired.

During this time there have been no idle hours, for at the Pittsburgh-Butler Airport the student is in one of the workshops of aviation and becomes part of the shirt sleeve phases of the industry. A continual stream of planes of all types pass through the airport for overhaul, repair or test, as it is the only approved overhaul and repair station in that section of the country.

The student either lives at the airport, in the regular dormitory or boards at a private home nearby. Consequently, he is able to devote his entire day to the acquisition of additional knowledge of his subject.

Central part of Pittsburgh-Allegheny County Airport as seen from the air.

The first three months of his ground course at this base are taken up with intensive airplane and engine mechanics training, conducted in classes which are of a practical nature. Theory is also covered, particularly in connection with such things as strengths, treatments and suitability of materials, stresses, fatigue, etc. In addition, welding is taught as an adjunct to the purely mechanical phases of airplane and engine trouble shooting, overhaul and repair. Several types of aircraft and engines are used in classroom work to provide the student with the widest experience in the various classes of equipment he may be called upon to handle.

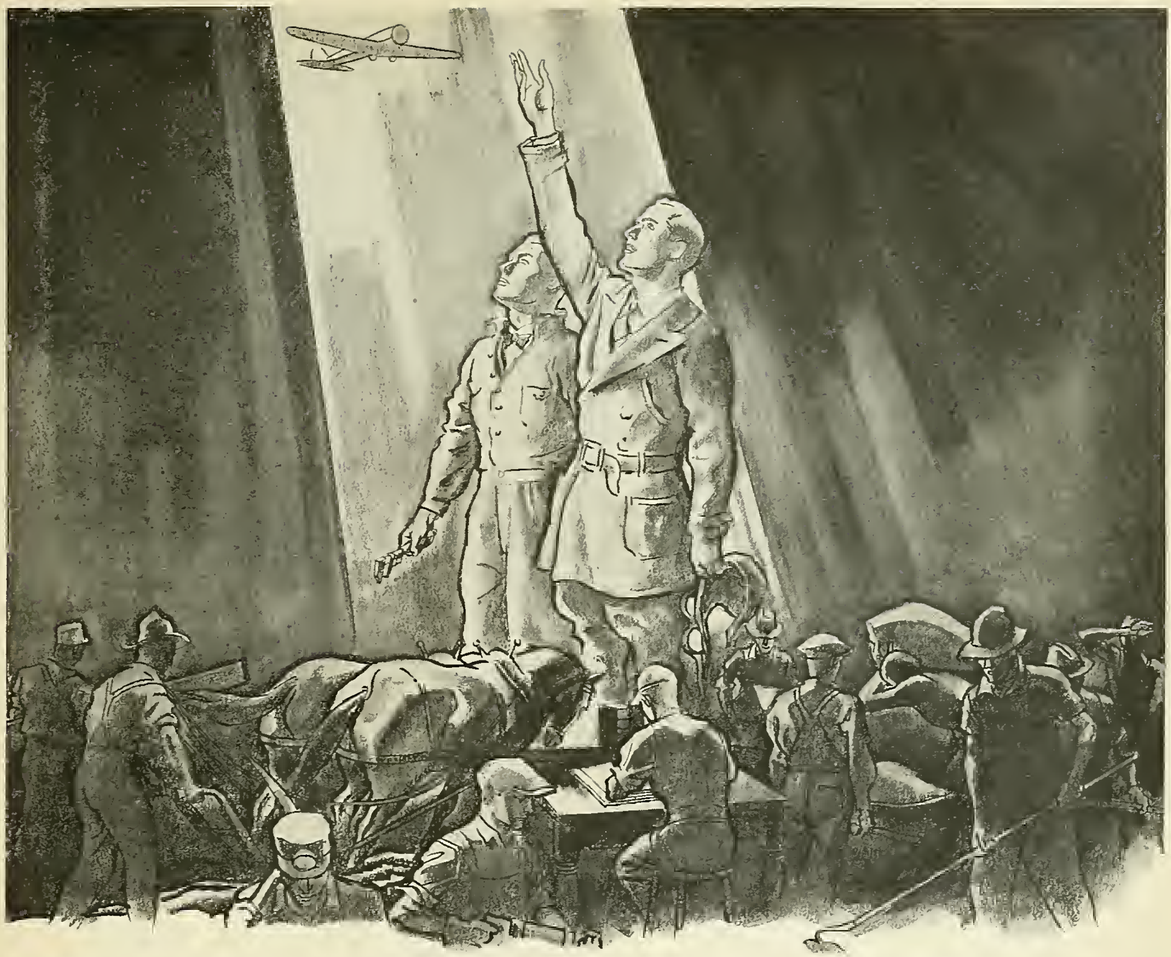
Upon the termination of class work he becomes a mechanic's helper and is assigned for periods of three or four weeks to each of the various departments: engine disassembly, assembly, overhaul and repair, dope room, propellers, etc., until he has had experience in all of the mechanical branches of aviation. He is subsequently transferred to the stockroom and thence to the general office where he becomes acquainted with the report, filing and other routine practices of the business side of aviation.

For additional experience he is sent from time to time to one or other of the Pennsylvania Air Line's terminals. For instance, in 1931 some fifteen Penn School students were in charge of the airplanes of foreign entries at the Cleveland Air Races.

The time required for this progression through the various ground departments approximately equals in normal cases the time needed to complete the flying training: that is, from a year to fourteen months. As a result, the student secures his Transport License and his Airplane and Engine Mechanic's License at almost the same time. This, however, does not mean the termination of Penn School's responsibility, or that the student can be regarded as a finished product. He is, however, sufficiently well versed in the practice and theory of aircraft operation to be employed in the industry.

After satisfactory completion of the course, the Employment Department endeavors to place the student with one of the companies with which it has connections. It is interesting that the industry has such confidence in this course that Penn School has been able to place all Master Pilot graduates in responsible positions. While graduates are employed, reports from his employer continue to be sent to the School which keeps in close touch with his progress.

The Master Pilot's Course outlined above has been cited only as an example, for, in addition, Penn School has fifteen



AD ASTRA...PER ASPERA

"TO the stars . . . through difficulties," said the ancients; meaning that only the will to surmount seemingly insurmountable obstacles in the path of ambition will bring us to the heights of achievement. "Intestinal fortitude" some call it and there is a shorter but less polite word that the Greeks didn't have for it.

The entire history of aviation is based upon that one word and the human determination it signifies. The industry will always be inspired and led by men with the courage to rise above defeat . . . with the will to do the impossible.

Penn School has guided many young men of this caliber to their desired goals in aviation. It is guiding many others today. In doing this, however, it has never failed to face facts and to tell the truth to prospective students. Our own graduate pilots have told us: "You are too conservative in your advertising. You don't promise enough yet you deliver so much more." Our answer has always been: "You, yourself, selected Penn School, and you are the type of man we want."

And we want others of this same type . . . men with "the love of the game" of course, but men also with the mental and moral courage to rise above setbacks and temporary discouragements, "through difficulties . . . to the stars."

For four years the name of Penn School has stood for all that is best in aviation training. This reputation has been won by a record of achievement in which not a single approved Penn School graduate has failed to pass the Department of Commerce flying tests. Because of its close association with Pittsburgh Aviation Industries Corporation and Pennsylvania Airlines, Penn School has outstanding advantages for training its students, in the needs of the industry. Penn School affords experienced guidance and opportunity for study and advancement in every branch of aviation. Write for particulars.

PENN SCHOOL OF AVIATION

Federal and State Approved

720 OLIVER BUILDING PITTSBURGH, PA.

Flying Schools: Pittsburgh-Butler Airport; Allegheny County Airport other courses. In the flying division these comprise amateur, private, limited commercial, transport and blind flying; while the ground school division consists of the amateur, private, limited commercial, transport, welding, airplane and engine, and basic ground courses; radio and instrument maintenance and overhaul; propeller maintenance and repair; electrical maintenance and repair. The same standards of thoroughness as in the Master Pilot's Course are maintained and the degree of success which has attended these methods is shown by the Penn School's record, for since its foundation in 1929 not a single graduate has failed to pass the Department of Commerce flying test. The Penn School has been able to operate over a million and a half miles of student instruction without a single major mishap, and approximately 50% of all the persons engaged in aviation in Western Pennsylvania are Penn School graduates.

In the field of scheduled air transportation the activities of Pittsburgh Aviation Industries Corporation date back to the early summer of 1930, when it became known that a transcontinental air mail line was to be established between New York and Los Angeles via Philadelphia, Harrisburg, Pittsburgh, Columbus, Indianapolis, St. Louis and Kansas City.

At that time in addition to the Pittsburgh-Butler Airport, which was the only first-class air terminal directly west of the Alleghenies, the Pittsburgh Aviation Industries Corp., also managed and operated the Harrisburg Airport—the logical terminal on the western boundary of the mountains. Since there was no single company at that time with the necessary qualifications to operate a project of this kind successfully, the Pittsburgh Aviation Industries Corp., in cooperation with Transcontinental Air Transport and Western Air Express, formed a new corporation known as Transcontinental & Western Air, Inc., to bid on the proposed route. The contract was secured by Transcontinental and Western Air, Inc., in September, 1930, and operations were begun in October of that year. Since then Transcontinental & Western Air, Inc., has progressed steadily, gaining in popularity each year.

Aerial view of the modern hangars and facilities at Pittsburgh-Butler Airport.

The second airline undertaking of the Pittsburgh Aviation Industries Corporation was in the same year, but subsequent to the formation of Transcontinental & Western Air, Inc., and involved CAM 11, the Cleveland to Pittsburgh air mail line known as Clifford Ball, Inc.

Control of this company was acquired in November, 1930, and the name changed to Pennsylvania Air Lines, Inc. At that time it was operating one round-trip by day between Washington, D. C., Pittsburgh and Cleveland, using four- and six-place single-engined cabin planes. Mail and passengers were carried between Pittsburgh and Cleveland and passengers between Pittsburgh and Washington. In addition, one round-trip was being flown at night with mail only between Pittsburgh and Cleveland.

Clifford Ball, Inc., had inaugurated air service between Cleveland and Pittsburgh, making its first flight on April 21, 1927, over a route designated as CAM 11 by the Post Office Department. At first no passengers were carried and operations at the end of the year showed that 19,572 pounds of mail were carried over 70,000 miles of flying during which 95 per cent of the scheduled mileage was completed. The following year, the Ball company started passenger operations and, although the start was somewhat inauspicious (only 725 passengers were carried), air mail poundage had increased to 54,852 and additional revenue was realized by the transportation of 36,600 pounds of express. In 1928, passenger service was extended to Washington, D. C.

Handicapped by lack of capital and insufficient personnel, little had been done to expand the service which Pennsylvania Air Lines had to offer or to develop the potential market for air mail and air passenger service in the territory through which the line operated. Accordingly the first step taken by Pittsburgh Aviation Industries Corp. was to supply additional working capital and increase the size of the organization.

R. W. Robbins was elected president, Clifford Ball was retained as vice-president in charge of operations, and H. S. Martin was also elected vice-president. Upon the resignation of Mr. Robbins, who resigned to assume the duties of president of Transcontinental & Western Air, Inc., Mr. Martin became president of the company, and C. Bedell Monro, executive vice-president, and W. J. Austin, vice-president in charge of traffic.

(*Continued on page 64*)

Sperry Instruments Improve Operating Efficiency of Pennsylvania Airlines

PENNSYLVANIA AIRLINES, INC.
February 2, 1934

Sperry Gyroscope Company, Inc.
Manhattan Bridge Plaza
Brooklyn, N. Y.

Gentlemen: We are pleased to inform you of the excellent results we have obtained from Sperry Instruments, which have been standard equipment on all Pennsylvania Airlines planes, and on both "blind flying" training planes of Penn School of Aviation.

We have found that these instruments are most economical and operate for the full period between overhauls with little servicing, some of them having functioned perfectly for more than 2,500 hours without maintenance, other than at regular overhaul periods.

It is of interest that all Pennsylvania Airlines pilots were trained in instrument flying by Penn School of Aviation, using Sperry-equipped planes. Further, since the installation of Sperry Instruments on Pennsylvania Airlines' Fleet, the operating efficiency has increased by 5.25%.

Yours very truly,
(Signed) H. S. MARTIN
President

HSM:mv

SPERRY GYROSCOPE CO., Inc., Brooklyn, N. Y.

B★A★30

BALLOON AND AEROPLANE

A grade A fabric developed specifically to secure certain features of superiority which are proven by actual comparative tests!

When we designed B★A★30 more than a year ago it was our purpose to build the lightest Grade A fabric yet made and still retain sufficient uniform strength to preserve an adequate margin of safety over the government specification minimum of 80 lbs. This would increase the pay load by decreasing fabric and dope weight and decrease doping costs.

Inasmuch as a chain is no stronger than its weakest link, we concentrated on building a fabric whose minimum strength in any one place exceeded the average minimum required by the specifications.

We set out with these aims over a year ago. We have sold B★A★30, a new fabric, to the aviation industry, not through any price cutting or bargain day activities but through sound engineering and merchandising of a superior product. To determine its superiority over other Grade A cloths we secured impartial comparative tests through the Textile Laboratory of Massachusetts Institute of Technology upon open market samples of B★A★30 and two other leading makes of cloth. These tests showed as follows:

(1) Minimum fabric failure for
B★A★30 was at 81 lbs.
Make X was at 77 lbs.
Make Y was at 73.5 lbs.

(2) Strength variation between maximum and minimum for
B★A★30 was 10.5%
Make X was 15%
Make Y was 19%

(3) Weight for
B★A★30 was 3.79 oz./sq.yd.
Make X was 3.87 oz./sq.yd.
Make Y was 4.15 oz./sq.yd.

In the face of the foregoing figures, substantiated by other reports, we sincerely believe that we have produced in B★A★30 an aeroplane fabric which is more uniform and stronger both per unit of weight and with respect to minimum strength than the leading Grade A fabrics on the market.

Write main office or nearest branch for prices, samples or other information.

★ WELLINGTON SEARS COMPANY ★

65 WORTH STREET, NEW YORK

Branches:

Boston Philadelphia Atlanta Chicago St. Louis Detroit New Orleans San Francisco

That Air Race to Australia

CY CALDWELL

● There are already two possible entries in the MacRobertson International Air Races from England to Australia. Operative Z-11 of the Caldwell Secret Service and Deplorable Defective Service, at present snooping around London, informs me that my friend Mr. C. G. Grey, Editor Extraordinary of *The Aeroplane*, is having a high-speed aeroplane designed for him at Farnborough. Named tentatively "The Sizzler," it will embody all the best features of the early RE 8's and everything in the way of a handicap which The Royal Aircraft Establishment has thought up since to harass the British Aircraft Trade. For many years now Farnborough has been wanting to do something for, or to, Mr. Grey; so therefore it may be taken for granted that "The Sizzler" will be something amazing, and very hot, indeed.

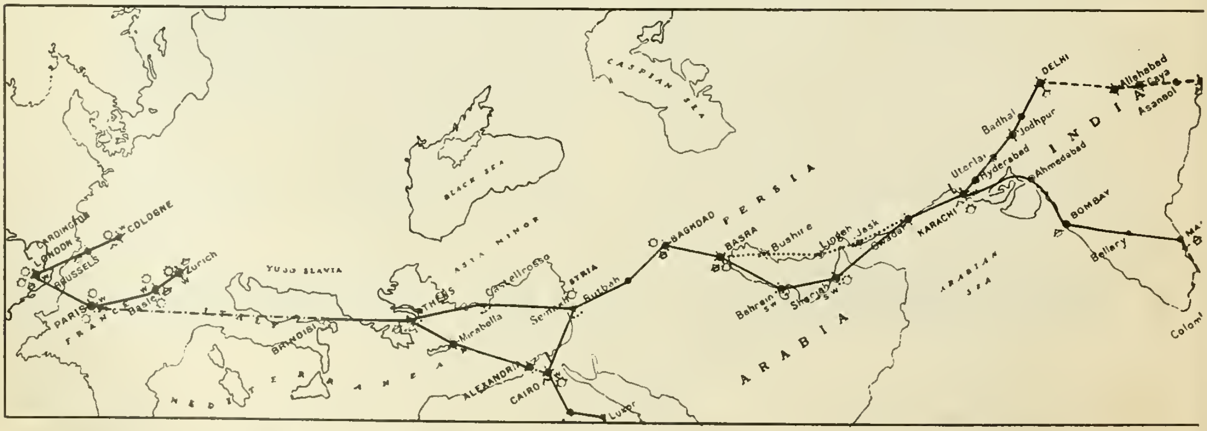
Bearded in his den recently by Operative Z-11, Mr. Grey proved to be secretive and uncommunicative, actually pooh-poohing the idea of his participation in the race. "I take umbrage at your inquiry," growled Mr. Grey, pouring himself a glass of umbrage and tossing it off with gusto. Then he placed the bottles of umbrage and gusto back in a cupboard and went to work on an editorial about the Russian Menace (his favorite Menace), and the price of ham in the Sandwich Islands—for in writing about aviation Mr. Grey covers a lot of ground, and sometimes even floats off into space.

Undaunted by this rebuff, however, Operative Z-11 backed out of the editorial sanctum and softly closed the editorial door covered with green felt which deadens all sound and renders Mr. Grey impervious to noise and even suggestions. Seeing a mysterious individual who never gets his name in *The Aeroplane*, but who is known simply as L. B. (which he had embroidered neatly on the back of his coat) my Operative tackled him, got him down, and with the aid of an automatic pistol, a blackjack, and a pair of brass knuckles which all Americans are known to carry in England, learned the following facts: It seems that Mr. Grey does not want so much to win the race, as he does to demonstrate what Farnborough could do if left to its own sweet devices. His participation, therefore, is rather in the nature of propaganda for British aircraft, demonstrating the value of Farnborough to the Trade. He is carrying with him a cargo of lions—all British lions from that part of Africa which England swiped from the local darkies—and as he sails over various foreign countries Mr. Grey will release these beasts, one at a time through a trap door, and send them down by parachute, carrying a sign "BUY BRITISH" and with instructions to bite severely any foreigners whom they may encounter.

Here Is My Entry

Now the second entry in this race is my own. Determined not to let my good English friend get ahead of me, I am going to purchase one of Secretary Vidal's $700 airplanes, when, as, and if completed. I am going to name it, by breaking a bottle of beer on the propeller (if any), "The Spirit of Wistful Hope," or "Democracy at the Cross-Roads," or perhaps simply "Quo Vadis," which in Latin means whither goest thou?—unless my lack of education has played me false again, as it so often does. For navigator (this is going to surprise and please you) I have selected Hiram Bingham. For a long time now I have been trying to induce Hiram to get out of Washington and the N. A. A., but he insists upon sticking there, even though nobody wants him. Surely, with the good of American aviation at heart, he cannot refuse to accompany me to the Sahara Desert, or whatever other inaccessible place he may inadvertently navigate us to. And if we don't come back, monuments will be erected in our honor; and if we return, the worst anyone can do is to sue us for disappointing them. How can we lose? In either event we get our names in the papers—and that's what Hiram has devoted practically his whole life to doing. I can just see the headlines: "Hiram Bingham Irretrievably Lost—Aircraft Stocks Advance Five Points on N. Y. Stock Exchange. Rails Decline." Hiram won't be missed by anyone, but the Pullman Company.

Mr. Grey and I are friends (like W. Winchell and B. Bernie) and correspondents of long standing; we carry on a furious and almost meaningless correspondence about war, the movies, patriotism, philosophy, and other crazy subjects. Each of us is firmly convinced that the other is insane, and perhaps we're both right. After I wrote the article in which I shouted loudly that American airplanes should win the MacRobertson speed race, he came back at me with the information



Air Ministry map showing British air routes between London, England, and Melbourne, Australia that the organizers have so arranged the race that contestants will have to fly through the very worst of the monsoon weather from Karachi to Singapore, and then went on to prove that the slower English planes might fly safely through weather which would break up a fast ship. I rather thought that he was pulling my leg, as he sometimes does, but in his interesting magazine he prints: "That means flying through rain which falls as if poured out of a bucket, or through clouds which are as black as night when the machine gets into them, and adding to the pleasure the knowledge that so far as experiments have shown, the tops of the clouds reach to at least 20,000 feet—a height which is not as a rule easily attained by high-speed aeroplanes loaded up for a long-range flight. Possibly some of our friends in America would like to calculate what would be likely to be the result if a high-speed, low-wing monoplane hit rain like that suddenly, going at about 250 m.p.h. Would the airscrew or the wings come off first?"

Can Our Planes Take It?

In his letter to me Mr. Grey went on to intimate that perhaps the slower English machines would wallow along calmly among all this welter of water, and thus come through, while the more speedy American plane would batter itself to pieces, leaving the pilot to descend by parachute to confront the startled natives *en route* with a strange accent of a slightly nasal quality. Well, I don't know; it would take a competent engineer with a rubber slide-rule to compute the forces of liquid resistance involved and the sort of structure necessary to withstand those forces. But just off-hand, and without any engineering information available, I'd say that Mr. Grey's tip is of value to American designers and pilots, and that they would be well advised to heed it. Once, in an incautious moment and a comparatively slow plane, I flew through what turned out to be a hail storm. I was rather timidly practicing a modest trifle of blind-flying and had my eyes fixed on the instrument board for several minutes. When I happened to look outside I was pained, hurt, startled, and considerably grieved to notice several rips here and there in the fabric; and I received a few stinging raps in the face which told me that I was in the middle of a summer hail storm. At 250 m.p.h. drops of water might be about as hard as hail, so why not prepare for that emergency? And pilots contemplating entering this race would be better off with a knowledge of blind flying; in fact, they might be quite lost without it. Of course, Mr. Grey and I will experience no difficulty with our ships, for having wallowed for years through the murky mazes of literary composition a mere monsoon will be no more than a drop in the bucket to us—we've gone through far worse than that, and lost nothing but a few readers and advertisers.

From time to time in the technical pages of Aero Digest you will come across descriptions of several American planes which are being designed especially for this race. I hear that Lockheed, Northrop, and Wedell-Williams are planning special ships for the speed race, and I have before me two mighty interesting Gee Bee designs by Granville, Miller & De Lackner. If I wasn't pinning my hopes on the Democratic and optimistic Old Maestro Vidal, I might consider using any one of these ships myself—if I had more than $700, which I haven't. However, I expect Mr. Vidal's airplane to fly just as well through water as it does through air, which is the reason I've selected it for the race:

The Distances To Be Flown

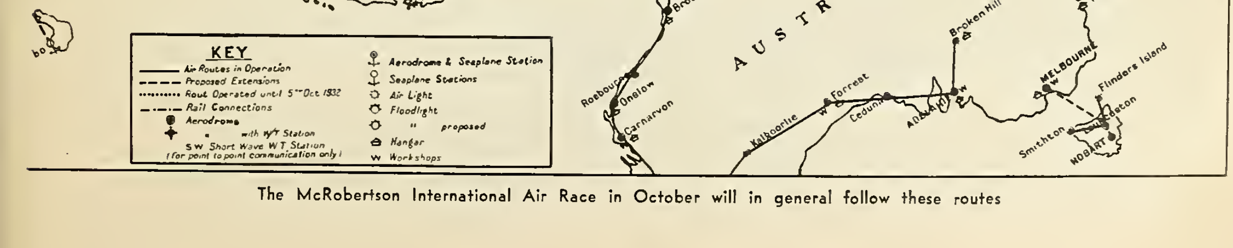
Here are the distances in miles: London to Constantinople, 1500; to Baghdad (control stop), 1040; to Karachi, 1545; to Calcutta (control), 1370; to Singapore (control), 1775 direct, or via Rangoon, 635 and 1184=1819; to Darwin (control), 1725 direct, or via Batavia, 478 and 1410=1888; to Charleville (control), 1260; and to Melbourne, 740 direct. I make this a total of 11,162 miles if the ship flies via Rangoon and Batavia, the safer route. Less flying over water is advisable in a landplane.

A Test of Speed and Safety

I hope that this race will demonstrate not only the speed of aircraft, but also the safety, even in racing ships. It's not going to benefit aviation if some of the boys drop into the Bay of Bengal or the Java Sea while trying to save a few miles. Of course, if Mr. Grey or I drop in, aviation may forge ahead, but I may say that neither one of us will fly over much water. We dislike water. In any dangerous stretches we intend to land, and be towed by a bullock, side by side, waving at each other in a friendly manner; for we are undertaking this race merely as a sporting gesture, with Scotch and gin as a chaser.

Full information about the races and entry blanks may be obtained from The Royal Aero Club, 119 Piccadilly, London, W. 1. Cable address, "Aerodom, Audley, London." Entries close June 1, 1934, and the races start Oct. 20, 1934. It is important to remember that several aerodromes *en route* are rather small, and that therefore it will be just as necessary to have a ship that lands slowly as it will be to have one that flies fast. For instance, Singapore aerodrome is only 1,000 yards in diameter; Darwin is 600 yards by 440 yards; Charleville, 700 yards by 600 yards. It just isn't going to be healthy to land at a hundred or so and glide right into a nearby filling station. Stopping to reassemble a fast-landing ship after each landing is going to lose a contestant too much time, to say nothing of the annoyance involved.

(*Continued on page 72*)



The McRobertson International Air Race in October will in general follow these routes

AVIATION ENGINEERING

TECHNICAL EDITORS: GLENN D. ANGLE • PROF. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

A Short Method for Determining Crank-pin Bearing Proportions

●

GLENN D. ANGLE

● Engineers are usually eager to adopt new methods when they are known to be reliable, and particularly when they offer opportunities to lighten some of the tedious tasks so often encountered in the regular routine of design work. The method for determining crank-pin bearing proportions which is about to be presented is not altogether new in principle, but it seems to take into account the variable factors involved more completely than any other in common use for making preliminary estimates of this sort. This method is not proposed as a substitute for a thorough engineering analysis, because all must agree that when one desires to accurately determine the maximum and mean loads upon a crank-pin bearing, he must resort to the development of a polar diagram of forces.

It is believed that the above well-known method for analyzing the loads upon both main and crank-pin bearings of an engine crankshaft was introduced (in this country at least) by Mr. Otto M. Burkhardt when he was associated with the Pierce-Arrow Motor Car Co. Some time later, the processes were described by Mr. Burkhardt in a paper entitled "Progressive and Retrogressive Designing," which appeared in the Journal of the Society of Automotive Engineers, April, 1919.

Application of Similar Methods

However, before the above treatise appeared, the writer had also begun to apply similar methods to the study of bearing loads in aircraft engines, and accordingly expanded upon the processes in order to deal more comprehensively with the variety of conditions encountered among the several types of engines in this category. That these analytical studies have usefully served their purpose since on innumerable occasions, or even that they have led to important determinations other than bearing loads, are well established facts and should require no explanation.

It is not proposed now to deal again with this manner of analyzing bearing loads, because the more important phases of the treatment have already been published. However, it seems essential at the very outset of this discussion to direct attention to these analytical methods, and their true value and importance in design work, so that we may possibly avoid and discourage the incorrect or exclusive use of short-cut methods, or empirical formulae such as we are about to present.

Preliminary Estimates

While laying out the design of a new engine, certain preliminary estimates are known to be necessary in order to facilitate progress. Naturally greater accuracy should be employed in estimating those dimensions and proportions which are not only important in themselves, but seriously affect the design of other parts of the engine as well. Sometimes these estimates may even prove to be final, and require only the usual mathematical analysis as a check; but this will depend in each instance, of course, upon the methods used and the reliability of the data upon which they are based.

Different methods have been employed in the preliminary determinations of the required projected area of a crank-pin bearing. Sometimes the dimensions are roughly acquired through comparisons with other designs whose characteristics are known. Again they may be temporarily fixed by the maximum unit load that is considered permissible when computing the area required for the greatest force of explosion which might be exerted upon the head of the piston. More often, however, the area is made to agree with some predetermined approximate relationship to the area of the piston head.

Designers have been known to make the diameter of the crank-pin equal some ratio of piston diameter, but we know very well that the torque transmitted by the crankshaft really determines what this diameter should be, and we therefore cannot place much confidence in a preliminary estimate of this sort. If we assume that the crank-pin diameter is made to satisfy the requirements of engine torque, the process of estimating the effective projected bearing area really becomes a matter of fixing the effective length, since the area is a product of length and diameter. In our references to effective length and area, we naturally neglect considerations of the radii or fillets at the ends of the bearing.

In the course of preparing a treatise dealing with the design of connecting rods, the author accumulated material for several tables giving the important dimensions of a number of well-known designs, and among them were some which dealt with big-end or crank-pin bearings. The average values for rods of each type certainly represent about the most reliable figures that could be used for preliminary estimates of this sort, and these figures are herewith presented for the convenience of designers who may wish to be governed by them during the preliminary stages of preparing new designs. As a matter of completeness, the ratios of crank-pin and piston diameter are included, but they are useful only for checking purposes.

Type of Connecting Rod	No. Cyls.	Crank-Pin Diameter	Area of Crank-Pin
		% Piston Dia.	% Piston Area
Plain	1	44.5	26.9
Forked	2	47.2	28.2
Articulated	2	49.3	27.1
Articulated	3	52.3	36.1
Articulated	4	53.8	37.4
Articulated	5	43.7	34.7
Articulated	7	44.3	41.5
Articulated	9	45.1	37.8

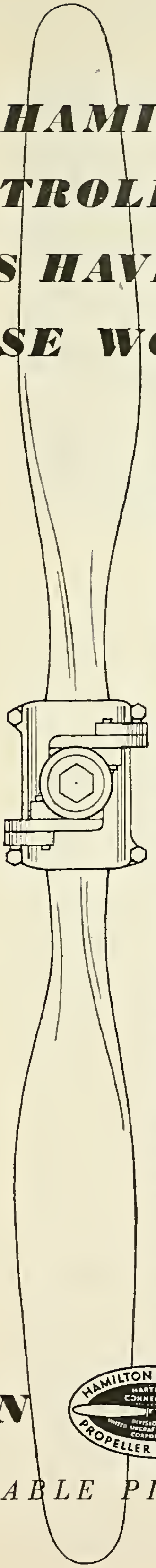
While the average ratios in the accompany table do not consistently increase with a greater number of cylinders in every instance, they show sufficient tendencies in this direction to safely conclude that the required bearing area is some function of the number of cylinders served. To arrive at expressions that would cover all practical problems of this sort, the writer plotted the minimum and maximum ratios determined from the data at hand, and then derived equations approximating the two curves. These may be written as follows:

$$A\ (\text{min.}) = A_p\,[.25 + .017\ (n-1)]$$
$$A\ (\text{max.}) = A_p\,[.325 + .0145\ (n-1)]$$

where

A = projected bearing area,
A_p = area of piston.
and n = number of cylinders.

(Continued on page 40)



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Northrop Alpha, Gamma and Delta
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Vultee V-1

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CONTROLLABLE PITCH PROPELLERS

Flight Testing Engine Installations

●

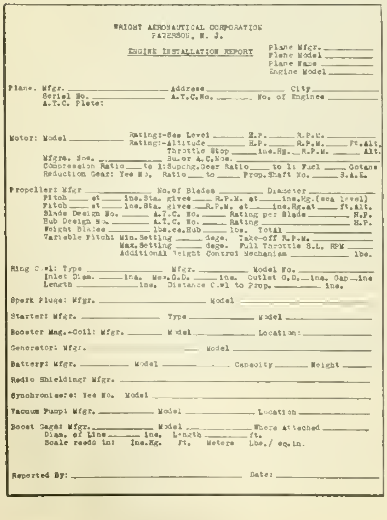
BURNHAM ADAMS

Sales Engineer, Wright Aeronautical Corporation

All of the major engine companies now maintain installation departments of personnel whose whole duty it is to cooperate with the aircraft manufacturers to insure the satisfactory operation of their engines. The writer has been associated with this work for some time and feels that a brief outline of the procedure developed for inspecting and testing new installations will be of considerable interest to both manufacturers and operators.

● The aircraft industry, as a whole, is gradually coming to a full appreciation of the fact that a large percentage of power plant failures are due primarily to deficiencies in the installations rather than design failures of mechanical parts of the engine. These deficiencies are also strongly reflected in the overhaul costs of the engine. Furthermore, it is now recognized that much of this trouble can be materially reduced by a very careful investigation of the engine installation at the time the experimental airplane is going through its early test flights. It is easy to hang an engine on the front end of an airplane in such fashion that it will last through the comparatively few hours of flying required for even a very complete investigation of airplane characteristics and performance but it is quite another matter to install the engine in such fashion that, when it is pulled for overhaul after 300 hours of operation, there will be no evidence of an improper installation. The greater amount of heat radiated by the more recent engines of high output has made the installation even more difficult as the most painstaking care must be devoted to detail in order to obtain the greatest efficiency possible under the limiting conditions.

It is obviously impossible for anyone but a super man to look over an installation and check all of the details worthy of notice without some sort of a list or form to follow. The writer has maintained a report form of this nature for some years and has added to it from time to time in accordance with the dictates of experience and the changes in standard equipment. This form is divided into sections each of which covers one phase of the installation. When completely filled out the first page offers a brief amount of information on the airplane, the more important details and operating conditions of the motor and identifying information for the propeller, ring cowl and all the engine accessories. The second page gives information on the fuel and oil used by the aircraft manufacturer and asks a number of what are sometimes embarrassing questions on the accessibility of the engine accessories. Succeeding pages offer sections on the fuel system, the oil system, the radiator and cooling system, the engine mount, cowling, the exhaust and carburetor air heater system and finally a page for photographs or additional sketches. Each section has sufficient space for sketches. If this report is filled out by an experienced observer, it leaves very little opportunity for questions asked at a later date which cannot be answered by a reference to the proper file. This inspection is usually made shortly before the first ground test and gives the installation engineer an opportunity to correct any major errors which might cause trouble even for ground operation. At this time, it is also possible to suggest improvements on minor points which have escaped notice on previous examination of drawings or mock-ups.



WRIGHT AERONAUTICAL CORPORATION
PATERSON, N. J.

ENGINE INSTALLATION REPORT

Plane Mfgr. ____
Plane Model ____
Plane Name ____
Engine Model ____

Plane. Mfgr. ____ Address ____ City ____
Serial No. ____ A.T.C.No. ____ No. of Engines ____
A.T.C. Plate:

Motor: Model ____ Ratings:-Sea Level ____ H.P. ____ R.P.M. ____
Rating:-Altitude ____ H.P. ____ R.P.M. ____ Ft.Alt.
Throttle Stop ____ ins.Hg. ____ R.P.M. ____ Alt.
Mfgrs. Nos. ____ Bu. or A.C.Nos. ____
Compression Ratio ____ to 1: Supchg.Gear Ratio ____ to 1: Fuel ____ Octane
Reduction Gear: Yes No. Ratio ____ to ____ Prop.Shaft No. ____ S.A.E.

Propeller: Mfgr ____ No.of Blades ____ Diameter ____
Pitch ____ at ____ ins.Sta. gives ____ R.P.M. at ____ ins.Hg.(sea level)
Pitch ____ at ____ ins.Sta. gives ____ R.P.M. at ____ ins.Hg.at ____ ft.Alt.
Blade Design No. ____ A.T.C. No. ____ Rating per Blade ____ H.P.
Hub Design No. ____ A.T.C. No. ____ Rating ____ H.P.
Weight Blades ____ lbs.ea.Hub ____ lbs. Total ____
Variable Pitch: Min.Setting ____ degs. Take-off R.P.M. ____
Max.Setting ____ degs. Full Throttle S.L. RPM ____
Additional Weight Control Mechanism ____ lbs.

Ring Cowl: Type ____ Mfgr. ____ Model No. ____
Inlet Diam. ____ ins. Max.O.D. ____ ins. Outlet O.D. ____ ins. Gap ____ ins
Length ____ ins. Distance Cowl to Prop. ____ ins.

Spark Plugs: Mfgr. ____ Model ____

Starter: Mfgr. ____ Type ____ Model ____

Booster Mag.-Coil: Mfgr. ____ Model ____ Location: ____

Generator: Mfgr. ____ Model ____

Battery: Mfgr. ____ Model ____ Capacity ____ Weight ____

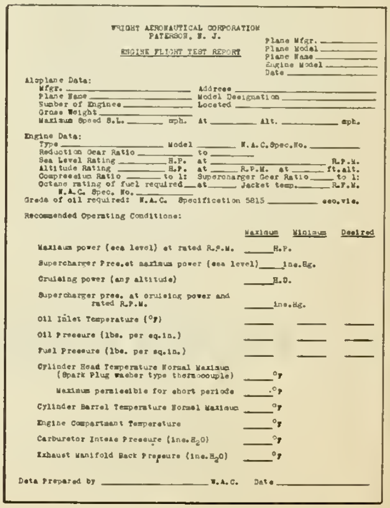
Radio Shielding: Mfgr. ____

Synchronizers: Yes No. Model ____

Vacuum Pump: Mfgr. ____ Model ____ Location ____

Boost Gage: Mfgr. ____ Model ____ Where Attached ____
Diam. of Line ____ ins. Length ____ ft.
Scale reads in: Ins.Hg. Ft. Meters Lbs./ sq.in.

Reported By: ____ Date: ____



WRIGHT AERONAUTICAL CORPORATION
PATERSON, N. J.

ENGINE FLIGHT TEST REPORT

Plane Mfgr. ____
Plane Model ____
Plane Name ____
Engine Model ____
Date ____

Airplane Data:
Mfgr. ____ Address ____
Plane Name ____ Model Designation ____
Number of Engines ____ Located ____
Gross Weight ____
Maximum Speed S.L. ____ mph. At ____ Alt. ____ mph.

Engine Data:
Type ____ Model ____ W.A.C.Spec.No. ____
Reduction Gear Ratio ____ to ____
Sea Level Rating ____ H.P. at ____ R.P.M.
Altitude Rating ____ H.P. at ____ R.P.M. at ____ ft.alt.
Compression Ratio ____ to 1: Supercharger Gear Ratio ____ to 1:
Octane rating of fuel required ____ at ____ Jacket temp. ____ R.P.M.
W.A.C. Spec. No. ____
Grade of oil required: W.A.C. Specification 5815 ____ sec.vis.

Recommended Operating Conditions:

	Maximum	Minimum	Desired
Maximum power (sea level) at rated R.P.M.	____ H.P.		
Supercharger Pres.at maximum power (sea level)	____ ins.Hg.		
Cruising power (any altitude)	____ H.P.		
Supercharger pres. at cruising power and rated R.P.M.	____ ins.Hg.		
Oil Inlet Temperature (°F)	____	____	____
Oil Pressure (lbs. per sq.in.)	____	____	____
Fuel Pressure (lbs. per sq.in.)	____	____	____
Cylinder Head Temperature Normal Maximum (Spark Plug washer type thermocouple)	____ °F		
Maximum permissible for short periods	____ °F		
Cylinder Barrel Temperature Normal Maximum	____ °F		
Engine Compartment Temperature	____ °F		
Carburetor Intake Pressure (ins.H_2O)	____ °F		
Exhaust Manifold Back Pressure (ins.H_2O)	____ °F		

Data Prepared by ____ W.A.C. Date ____

First pages of two nine-page engine reports, one for the installation data and the other for the flight test record

For use in checking the actual engine performance another form is maintained. This form is not intended for use as a log sheet on a flight test as it is felt that every aircraft manufacturer has his own flight test log sheets and pilot instrument board in constant use and therefore would prefer to use it. The form calls for certain information which the aircraft manufacturer can secure during the course of his normal airplane flight testing as the flights required by both the engine and aircraft manufacturers are practically identical. The engine tests mean very little additional effort except for the recording of the additional readings.

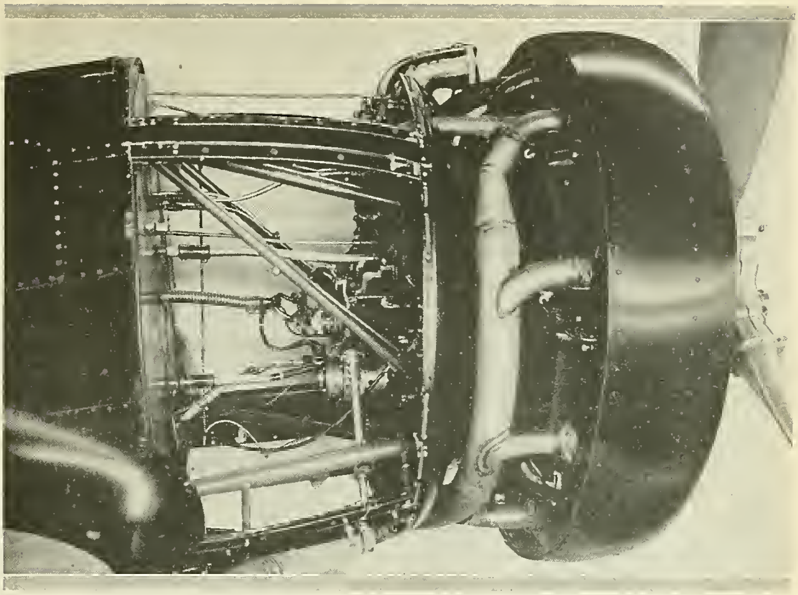
As in the case of the installation report, the first part of the flight test report offers a brief identifying outline on the airplane but a considerable amount of information as to the engine. This includes all the power characteristics both at sea level and altitude, the fuel and oil required, the supercharger pressure limits under recommended cruising conditions and full power conditions and in addition the maximum, minimum and desired values of pressure and temperature conditions of the engine.

The first test data required are taken during the run-up at full throttle on the ground. Then follow conditions of full throttle level flight and cruising flight at sea level and at the critical altitude of the engine. As cooling conditions during climb are very severe, a full throttle climb to ceiling at best climbing speed is requested. The worst condition under which an engine will ever operate occurs in the case of a twin-motored ship compelled to cruise at full throttle on one engine due to the failure of the other, or in the case of a tri-motored ship cruising at full throttle on two engines in case of failure of the third. It is therefore, essential to discover just how the engines will operate under these conditions and a run is made to secure the required data.

As there are a large number of conditions which can affect the carburetion, it has been found advisable to include a number of specific questions on this subject as a check on both the air scoop installation and the fuel system. The final page of this form records considerable information concerning the aerodynamics and the performance of the airplane. While these data do not directly concern the engine or its installation, they are frequently used at a later date for calculating performance of the airplane when other engines or models of different altitude ratings are being considered as replacements. This information is regarded as highly confidential and is filed separately from the rest of the report.

For flight testing it is necessary to make the temporary installation of a number of instruments for checking the operation of the engine as indicated in the list following. This list includes several instruments indicated with a star (*) which have a permanent place on the instrument board but are included as a matter of record.

*Tachometer (R.P.M.)
*Supercharger Pressure Gage (in. Hg. absolute)
*Oil Pressure Gage (lbs. per sq. in.)
*Oil Inlet Thermometer (°F)
*Fuel Pressure (lbs. per sq. in.)
Strut Air Thermometer (°F)
Carburetor Air Inlet Thermometer (°F)
Carburetor Air Inlet Pressure Gage (in. H_2O)
Exhaust Manifold Back Pressure Gage (in. H_2O)
Cylinder Head & Base Thermocouples all cylinders (°F) (air-cooled engines only)
*Prestone Outlet Thermometer (°F) (Liquid-cooled engines only)
Cylinder Cooling Air Flow Gage (in. H_2O)
Oil Cooler Air Flow Gage (in. H_2O)
Coolant Radiator Air Flow Gage (in. H_2O) (Liquid-cooled engines only)
Ground Instruments
Barometer (in. Hg.)
Air Thermometer (°F)



Installation of the 715 h.p. Wright series F Cyclone engine showing accessibility of all the accessories at the rear

There has recently been a very strong trend towards highly supercharged engines which must be throttle-stopped at sea level and operated under conditions which will prevent exceeding a certain maximum power output. This has led to the wide-spread use of the supercharger pressure gage, or "boost gage" which, when used with the tachometer, gives the engine manufacturer an absolute indication of the engine power output. When controllable pitch propellers are used, the boost gage is a great convenience even on an engine which can be operated at full throttle sea level as the engine manufacturer can recommend that at cruising speed the throttle and propeller pitch can be adjusted until a specified combination of manifold pressure and engine revolutions is obtained giving the normal cruising horsepower. This obviates the necessity of setting the propeller at full power and then throttling back to normal cruising r.p.m. During the flight test, it is used to determine the amount of additional power which is being gained through the use of a ramming air intake and is an essential accessory when the throttle stop is being set. The supercharger pressure gage is then an instrument which should be included in every airplane powered with a modern engine of high output.

One of the instruments called for is a pressure gage calibrated in inches of water from about —10 inches to a minimum of +25 inches and connected to a line run to the ⅛-inch pipe tap connection provided in the inlet flange of the carburetor. The most convenient form of gage is an altimeter with the hand moved to read about 4000 feet and a paper dial calibrated in inches of water. This is infinitely superior to the cheaper but much bulkier manometer which is practically useless in rough air due to the wide fluctuations caused by the difference in inertia of two columns of water of unequal length. This reading is of interest under almost all conditions of flight. During a climb it gives an indication of the air conditions surrounding the intake scoop which may be so sheltered that a negative reading is obtained with consequent loss of power and upsetting of the carburetion. In level flight, it tells whether the ramming effect of the intake is excessive in which case enough power may be gained to cause detonation and overheating of the engine even when using the recommended grade of gasoline. By comparing the pressures obtained at this point with the air heater valve in the hot and in the cold positions, it is possible to tell whether or not the air heating system is restricted and resulting in the loss of power. As a general rule, it is advisable to provide more ramming effect with the hot air intake than with the cold air intake in order to overcome the power loss to be naturally expected from heating the air. This gage offers the only means of determining whether a power loss observed on the tachometer comes from the restriction or from the higher temperatures.

The ordinary bulb type of oil thermometer is admirably suited for measuring carburetor air inlet temperatures. Before installation, it should be calibrated against a reliable mercury thermometer. Readings from this thermometer with the air heater valve in the cold position give an indication of the amount of leakage by the valve which, if excessive, will cause a loss of power on clear days when there is no necessity for using the heater to avoid icing. By comparing the "cold air" reading with the "hot air" reading, it gives an indication of the efficiency of the heater and tells whether or not the heater capacity is adequate to prevent ice formation. The amount of temperature rise required is now the subject of some discussion and the requirements vary from 60°F rise as required by the military services to 100°F now asked for by the airline operators. It is safe to say that 60°F is undoubtedly a minimum requirement and where the thermometer is permanently installed there is no objection to going as high as 120°F. It is obvious, however, that without the thermometer to use when adjusting the valve there is no point in having as high a rise as 120°F, which would cause an excessive and useless loss of power. The writer feels that for the most efficient operation, the heater should have an excess capacity and that the thermometer should be used permitting the pilot to adjust the temperature to approximately 80°F under any but the most adverse weather conditions.

The exhaust manifold is an accessory which can cause the most costly and serious kind of trouble. Excessive back pressures result in high cylinder head temperatures which in turn can cause valve failures, valve seat pitting, loosening of the guides and stuck pistons. For measuring this pressure, another line is run from a manifold attached to the gage used in measuring the carburetor air inlet pressure. It is not essential to record the pressure at every cylinder on the engine if an experienced observer is permitted to select for investigation those outlets which appear to him to be the most apt to have high pressures. As the engineer knows nothing about the pressure existing in the manifold at any place other than at the valve port, it is obvious that the pressure should be measured as close to the port as possible. The best method of connecting the gage to the exhaust outlet is with a piezometer and it is expected that within a short time special fittings of this type will be available for tests of this nature. For the present, however, the accepted practice is to weld a boss with a ⅛-inch pipe tap hole on to the side of the outlet in such a position that it will not record any of the velocity head of the moving exhaust gases. This is especially important as cases are known where an incorrect location of this gage has caused the manufacturer to make expensive alterations to a manifold which would have shown a satisfactory pressure had the connection been located correctly. First weld on the boss and then drill a No. 50 hole through the wall of the pipe inside the boss. Clean off the burrs very carefully but do not chamfer the inner edge of the hole as anything but a sharp corner will cause an erroneous reading. The maximum pressure permissible at this point of an exhaust manifold is 6 inches of water but it is felt that even this is higher than should be allowed as experience has indicated that it is perfectly possible to construct a manifold of convenient size which will record pressure below atmospheric at any point. The engine manufacturers are now in a position to make very definite recommendations on designs of this type.

The test specifications call for the measurement of all cylinder heads and bases as a result of many experiences where individual cylinders have been found to run hotter than the average due to variations of one kind or another in the installation. The cause of this may be in the exhaust manifold, the cowling or in some obstruction to the air flow behind the cylinder. The maximum limits on these temperatures vary slightly with the engine under consideration.

The effect of high air temperatures in the accessory compartment behind the engine is far-reaching and can cause quite a number of difficulties. It slows down the heat dissipation from the oil tank and oil lines, thereby reducing the temperature drop through the oil system. If the temperature is higher than the 10% point of the fuel distillation curve, it may cause excessive vaporization of the fuel in the lines thereby increasing the probability of vaporlock. It shortens the life of the magneto by softening or melting certain of the insulating compounds used in their construction. As the fire wall is usually right at the pilot's feet the heat passing through the wall will raise the cockpit temperature and can make it on occasions exceedingly uncomfortable. High temperature is an indication of inadequate ventilation and in case of a gasoline leak may permit the accumulation of gas fumes in high enough concentration to present a severe fire hazard. For all these reasons, it is highly desirable to check this temperature, using a thermometer which, as in the case of the carburetor air inlet thermometer, can be of the calibrated oil temperature type. The bulb should be so located as to give a fair indication of the average temperature in the compartment and is usually suspended near the rear and towards the top of one of the magnetos. As a general rule, the temperature of this compartment when well ventilated will not be more than 35°F higher than that of the outside

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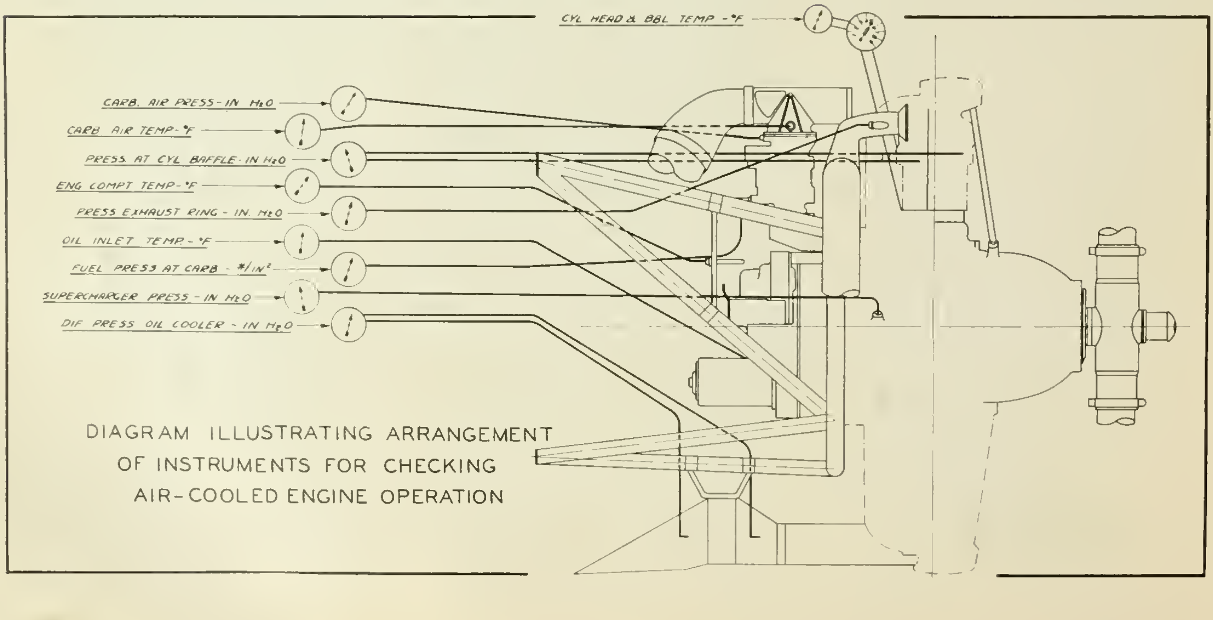
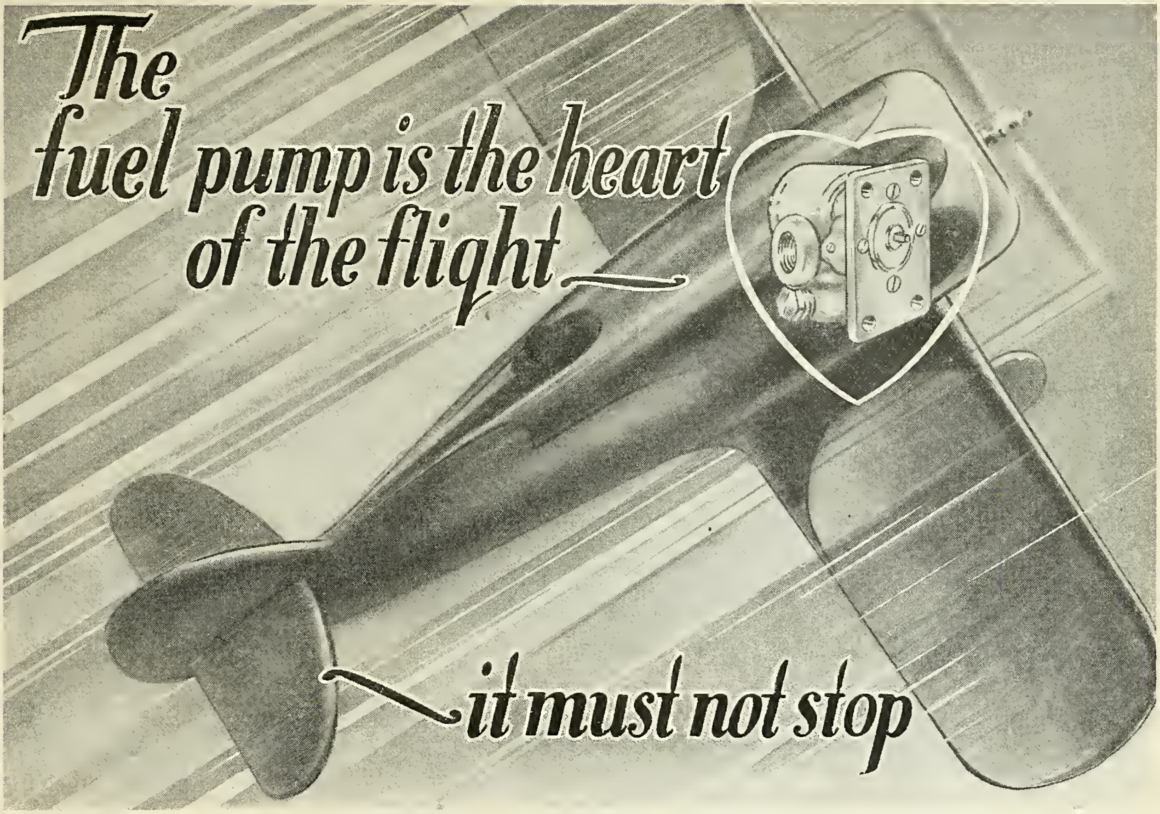
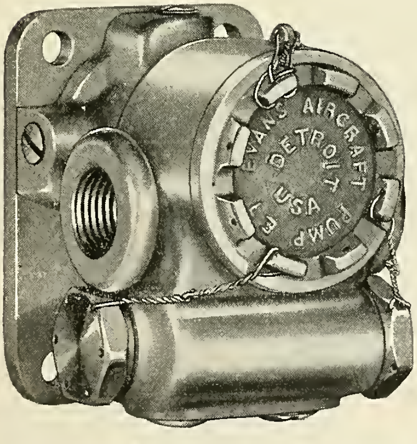

CYL HEAD & BBL TEMP - °F
CARB. AIR PRESS - IN H₂O
CARB AIR TEMP - °F
PRESS AT CYL BAFFLE - IN H₂O
ENG COMPT TEMP - °F
PRESS EXHAUST RING - IN. H₂O
OIL INLET TEMP. - °F
FUEL PRESS AT CARB - #/IN²
SUPERCHARGER PRESS - IN H₂O
DIF PRESS OIL COOLER - IN H₂O

DIAGRAM ILLUSTRATING ARRANGEMENT OF INSTRUMENTS FOR CHECKING AIR-COOLED ENGINE OPERATION


The fuel pump is the heart of the flight
—it must not stop



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1. An exclusive sylphon seal which insures against leakage by automatically compensating for wear under long usage. . . . 2. An exclusive flexible shaft eliminating all chance of breakage through misalignment. . . . 3. An exclusive feature allowing the rotation of pump in either direction without changing valves. . . . 4. A wabble pump by-pass designed to eliminate external line entirely. . . . 5. An internal relief valve which can be adjusted to any desired operating pressure. . . . 6. Extreme lightness in relation to volume.

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MICHIGAN

(*Continued from preceding page*)

air and every effort should be made to keep this temperature below 120°F in flight under adverse conditions.

The fuel pressure gage is nothing new but it is recommended that even in the case of a gravity system when ordinarily no pressure gage is used that the fuel head on the carburetor be measured to make sure that the system will function correctly. In the case of the Whirlwind engine, it is possible to modify the carburetor setting to compensate for the effect of a very low head but in the case of the Cyclone engine this is not possible. If the head does not produce a minimum pressure of 2½ #/sq. in. measured at the carburetor, it is essential that a fuel pump be used. The head on a gravity system should be recorded while the engine is running at full power as it is possible to have quite a difference in pressure between the static and operating conditions due to restrictions in the line. Under ordinary flight conditions, the fuel pressure will usually remain quite constant but during aerobatics may fluctuate enough due to the fuel being thrown away from the tank outlet to indicate that changes in the point of connection of the line to the tank may be advisable.

The oil pressure gage is likewise a standard instrument and the only conditions during which variations are likely to occur are in violent maneuvers. Cases have been noted where in a "push over" dive, when the oil is thrown away from the oil tank outlet opening, the pressure is liable to drop and take some little time to recover.

In cases where an ice indicator is installed as regular equipment, this instrument is admirable for indicating the outside air temperature. Otherwise the standard mercury or vapor type strut thermometer usually available in any aircraft plant should be used. The values recorded are essential as a basis for judging whether or not the installation which may be set at modern air temperatures is going to be adequate under extreme high air temperature conditions.

Ordinarily it is necessary to measure only the oil inlet temperature in order to judge in a satisfactory manner the efficiency of the oil cooling system. In some cases however, where the cooling system has been proven unsatisfactory for no obvious reason, it is later necessary to also measure the temperature between the oil cooler and the tank and between the tank outlet and the engine in order to determine in what part of the system the trouble is to be found. These comments also hold true in the case of the cooling system of a liquid-cooled engine except that the outlet temperature is invariably measured. Measurement of the static air pressure ahead of and behind the engine gives an index to the air flow over the cylinders and is remarkably useful in working out the cowling design to best advantage. The instrument used is again a calibrated air speed indicator but hooked up to measure the difference in pressure between the front and rear of the engine. A pitot type head is used but both legs are for indicating static pressure and one is about six inches longer than the other. The long leg extends forward horizontally through a hole in one of the intercylinder baffles while the end of the short leg remains behind the baffle.

The effect of the pressure drop on cylinder head cooling is indicated on the illustrated curve which indicates the necessity of obtaining a minimum value of eight inches of water.

The pressure drops across the oil cooler and coolant radiator are measured in the same manner, and indicate whether or not the airplane designer is getting the most out of the installation. It is comparatively easy to secure a drop of 4 inches of water across an oil cooler or 4 inches across a coolant radiator and these values are essential for adequate cooling. The heads used are again both of the static type and are located far enough ahead of and behind the cooler or radiator to be in an area of normal flow.

The only instruments necessary on the ground are the barometer and air thermometer ordinarily found in any Weather Bureau's office.

For the first airplane, the manufacturer will find that a very careful calibration of all the above instruments before installation will in the long run pay big dividends as it will occasionally save expensive alterations made to cure an unsatisfactory condition which actually does not exist.

Digest of Technical Articles from Foreign Publications

ELSA GARDNER

Aerodynamics

Conditions and Tendencies in Experimental Aerodynamics (Condizioni e tendenze dell'aerodinamica sperimentale), A. Eula. L'Aerotecnica, Vol. 13, Nos. 8 and 9, August and September, 1933, pp. 1021-1037 and 1181-1192, 19 figs.

AFTER RECALLING the duplex character of aerodynamics, both theoretical and experimental, as well as the principle of relativity, the author devotes the remainder of the first article to wind-tunnel methods of research. He illustrates the most modern types of wind tunnels including those located in the United States, England, Germany, France and Russia as well as in Italy. He places in evidence the defects of this method of aerodynamic research which result from insufficient Reynolds number and from the effects of turbulence and suggests means for avoiding them. He concludes with a discussion of aerodynamic experiments relative to superaviation and those destined to make visible and photographable, the various phenomena of aerodynamics.

Spinning

The Effect of Ailerons on the Spinning of a Bristol Fighter Aeroplane, A. V. Stephens. (British) Aeronautical Research Committee—Reports and Memoranda No. 1555, June 10, 1933 (Published October 30, 1933), 7 pp., 5 figs.

COMPLETE MEASUREMENTS of a series of spins, covering the available range of aileron movement, were obtained with the airplane loaded normally and with 40 pounds of shot in each wing tip. The effect of applying the aileron in either direction during the recovery from a normal spin was also investigated. Ailerons were found to exert a large influence upon the character of the steady spin. Crossing the ailerons rendered the spin flatter, whereas setting them "with" the spin had the opposite effect. The total range of incidence obtainable in this way was from 33 to 60 degrees for the aircraft under normal load.

Calculation of Spinning by the Induction Method for a Monoplane Wing and Comparison with the Strip Method (Calcolo dell' autorotazione col methodo dell'induzione in ala monoplana e confronto col methodo della striscia), L. Poggi. L'Aerotecnica, Vol. 13, No. 10, October, 1933, pp. 1255-1293, 4 figs.

FORCES AND moments are calculated analytically for a wing moving with a translatory motion superimposed on a rotary one about an axis placed in its plane of symmetry. Induced velocities. which until now have been ignored in analogous calculations, are included. The author explains how it is possible to reduce the problem of determining the induced velocities to that of a wing of given form met by a current of variable velocity along the span. He uses the Glauert method of solution.

After determining the distribution of the actual velocities on the rotating wing, he calculates the moment and force coefficients relating to their axes. Numerical calculation of these cofficients is carried out for various values of angular speeds and for various positions of the axis of rotation, on the basis of both the apparent and actual velocities, bringing out the remarkable effect of the induced velocities.

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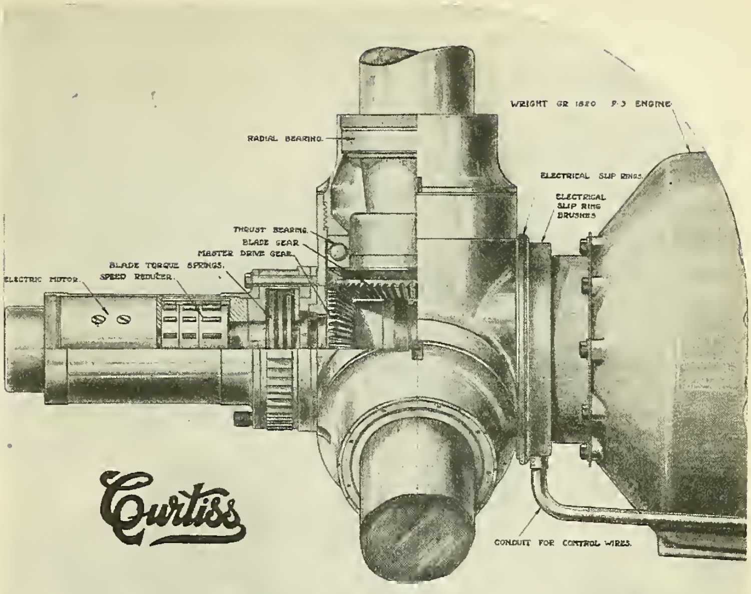

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● *You may buy a bearing as a bargain but try and get a bargain out of using it, for nothing is apt to cost so much as a bearing that cost so little*

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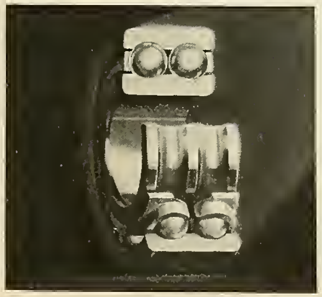

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SKF
Ball and Roller Bearings

(*Continued from preceding page*)

Engine Gumming

Measurement of the Interior Tightness of Internal Combustion Engines; Study of Gumming (Mesure de l'étanchéité intérieure des moteurs à explosion; étude du gommage), N. Champsaur and C. Martinot-Lagarde. Publications Scientifiques et Techniques du Ministère de L'Air, Service Technique de L'Aéronautique, No. 31, 1933, 61 pp., 15 figs. 25 tables.

FROM THE numerous tests carried out in connection with the report, the authors were able to develop a method for studying the gumming of the parts of an internal combustion engine. They agree with Boerlage that gumming can be attributed to a lubricant only in exceptional cases. They determined that gumming is produced more rapidly in a new engine than in one which has been used for some time. Tests to find the effect of the nature of the fuel on gumming gave contradictory results. It was found that external conditions plainly influenced gumming, for certain mineral oils which appeared to gum rapidly in cold weather caused no gumming in hot seasons. It is considered possible that external conditions affect also gumming through their. action on the carburetion. The authors conclude that gumming should be attributed to too high a piston temperature or to too abrupt an increase of that temperature; to a defect of intake or renewing of oil in the grooves, or to poor combustion.

Propeller-Shaft Speeds

The Critical Velocity of Shafts Carrying Aircraft Propellers (Le velocità critiche degli alberi porta-elica dei velivoli), A. Bellomo, L'Aerotecnica, Vol. 13, No. 10, October 1933, pp. 1324-1333.

CRITICAL SPEEDS for the bending elastic equilibrium of propeller shafts are calculated, taking into account the effects of both the twisting moment and the axial thrust. The mass of the shaft is approximately accounted for by a reasonable increase of the propeller mass. The method employed is that introduced by Rankine and consists of writing the differential equations of the elastic curve of the shaft and imposing as many boundary conditions as there are arbitrary constants in the integral of the elastic curve.

Aerial Photography

Annual Report on Aerial Photography (Annales de photographie aérienne), H. Roussilhe. Publications Scientifiques et Techniques du Ministère de L'Air, Service des Recherches de L'Aéronautique, No. 30, 1933, 128 pp., 40 figs., 3 tables.

RESULTS OF research on aerial photography in France are given, including: Report of the Permanent Consultative Commission on Optics and Aerial Photography to the Air Ministry, C. Fabry; Problems of Interchangeability in the Construction of Photographic Equipment designed for Military Aviation, Lebelle; General Ideas on Photographic Sensitometry, Lebelle; Sensitometry of Papers for Aerial Photography and Other Subjects of the Partial Interval of Light, Labelle; Study of a General System of Photographic Sensitometry, Cordonnier; Contribution to the Research for a Practical Method of Controlling Developers, Roulleau; Multiple Objects of Aerial Photography, Roussilhe; Establishment of a Polygon of Control for the Study of Materials for Aerial Photography, Roussilhe.

Casting Magnesium

The Casting of Magnesium (La fonderie du magnésium), A. Caillon and R. De Fleury. Publications Scientifique et Techniques du Ministère de L'Air, Service des Recherches de L'Aéronautique, No. 32, 1933, 141 pp., 70 figs.

THE METALLURGICAL questions arising in the casting of magnesium alloys having been solved by M. Hardouin in a previous report (abstracted in the December issue of AERO DIGEST), the present report deals mainly with practical problems in the magnesium foundry, and describes the best types of foundry equipment. The necessity for the protection of magnesium by a flux and the viscosity of the mixture of boric acid is further discussed, however. An industrial method is described which uses three fusion fluxes in succession and eliminates all danger of including chlorides in the castings. Recuperation of slag and turnings is also considered. The flow of the metal in green sand is studied and the protective action of sulphur, boric acid and ammonia fluoride proved. Industrial conditions for the use of molding sands for founding magnesium are defined.

Fuel Injection

Problems Raised by the Injection of Fuel in a Diesel Engine, Especially in Variable-Speed Engines (Problèmes soulevés par injection du combustible dans les moteurs Diesel, notamment dans les moteurs à vitesse variable), R. Retel. L'Aéronautique (L'Aérotechnique Section), Vol. 15, No. 173, October, 1933, pp. 93-105, 24 figs.

THE THEORY of fuel injection in Diesel engines for aircraft is analyzed in detail. The author shows that from the standpoint of fuel injection, combustion depends on the quality of atomization, a perfect mixture of air and fuel, and the exact regulation of feeding the fuel. In discussing the importance of atomization, he explains the influence of cohesion of the fuel, back pressure, turbulence, and speed of the jet by means of graphs and microphotographs, and describes the effects of centrifugal and other types of jets. In regard to mixture of the fuel and air, he illustrates the influence of the injection pressure and compares six different forms of combustion chambers. In taking up the regulation of the feed, he shows the influences of the pump rotating speed and the orifice section on the regularity of feed.

CRANK-PIN BEARING PROPORTIONS

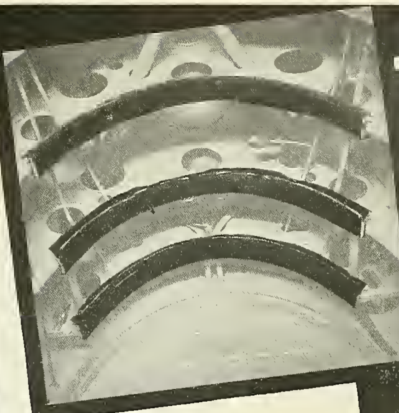
(*Continued from page 32*)

These simple equations should prove quite useful while making preliminary estimates, because it is fairly certain that the actual requirements of the design will fall somewhere between the computed results. The reader will appreciate that a much closer means of estimating could hardly be employed with designs of all sorts, in which the applied forces will naturally vary with the size of the engine, its rotational speed, and the weights of rotating and reciprocating parts. It is confidently anticipated that these empirical equations may be the means of saving much valuable time, not only during the early stages of preparing a design, but later on when it is found through accurate estimating that only minor changes, if any, are necessary as a result of the final engineering analysis.

In concluding these remarks, it might be well to offer an explanation for some of the variations in the ratios which have just been examined. In the first place, in the Vee, W and X forms with two, three and four rods operating upon each crank-pin, the crank-pin diameter, and possibly its area, are governed largely by the torsional and bending loads peculiar to crankshafts having more than one crank throw. While it is aimed to direct our comments to engines of the radial arrangement, we cannot segregate the various engine forms and secure comparative results for all connecting rods of the articulated type.

Among the engines of five, seven and nine cylinders, which are all radial in form, we may observe a consistent increase in the ratio of crank-pin diameter with additional cylinders. Contrary to any logical basis of reasoning, the average ratio of the bearing area was actually higher for the seven-cylinder designs than those employing nine cylinders. However, further investigation disclosed that many designs of this group were employing unnecessarily low unit bearing pressures, and the length of the crank-pin bearing had been controlled more by the big-end construction of the connecting rod than by considerations of safe loads.

It is readily understood that one or two designs of the "rule of thumb" variety in any group might make quite a difference in the resulting average ratio. Furthermore, there is little doubt that such variations would be greatly modified if data upon more approved engines had been available for this investigation.



Felt

is resilient and it does not deteriorate with age, heat, or cold. Felt provides a permanently satisfactory insulating material for weather proofing, sound absorption, vibration dampening, oil retaining, etc.

Felt is used in aeronautical engineering for all of the above purposes. It is sufficiently uniform in nature to meet specification requirements based on standardization tests.* It may be varied in density, thickness, and composition to meet special requirements.

It is easily bonded to metal, plywood, or composition material. It may be accurately cut or died out with firm non-fraying edges.

We invite correspondence from engineers and builders of aeroplanes and aeronautical instruments.

* Write for technical reports of tests of felt made by Daniel Guggenheim School of Aeronautics, New York University. These tests demonstrate felt properties and establish standards. Eleven tests include Friction, Resiliency, Heat Transmission, Tensile Strength, Tear Strength, Oil Retention, Soundproofing, etc.

Illustration in upper left shows felt padding as used on frame of Glenn L. Martin plane; upper right illustration shows canvas covered felt strips for a fuel tank on the Curtiss XF9C-2; bottom photo shows felt used in back of the instrument on Leeds and Northrup Micromax Temperature Recorder to protect against temperature variation and also against shock.

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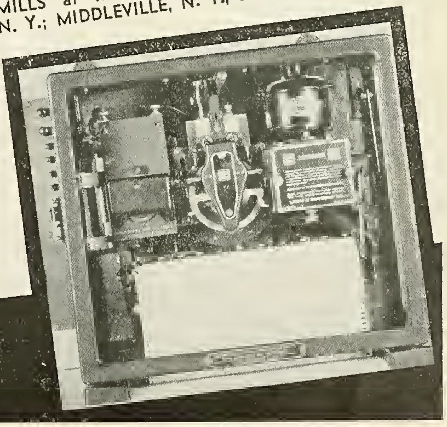


225 Horsepower Jacobs L-4 Engine

● Developed to stand the abuse of miscellaneous commercial use under all conditions with a minimum of attention and service, the new Jacobs L-4, a static, seven-cylinder, radial air-cooled engine rated 225 h.p. at 2,000 r.p.m. has been introduced by the Jacobs Aircraft Engine Company. Particular attention has been given in this engine to the needs of the power requirements of the four-place cabin and the high-performance two- and three-place open cockpit types produced by the commercial airplane manufacturers in this country, but the power plant needs of military training ships have also been taken into consideration.

In determining the design and construction of the L-4, its engineers have aimed at durability and simplicity and have evolved an engine designed to give service and deliver full power output on ordinary 73 octane gasoline without the constant maintenance under highly skilled supervision that is available to engines in military and regular air transport service. Furthermore, since the engine was designed for higher compression and considerably higher power output than it is developing at its present rated power, every part is under considerably less stress than designed for.

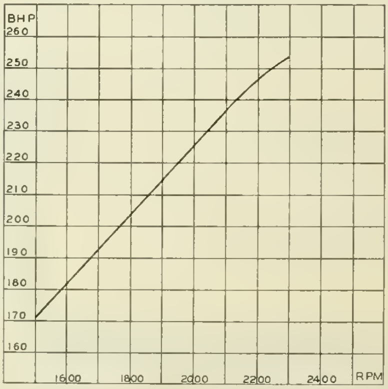
Performance Efficiency

Performance was a secondary consideration. Due to the use of the most recent knowledge and practice and the latest developments in materials, high performance efficiency with the serviceability aforementioned have been attained, as evidenced in the weight-to-power ratio of 1.85 pounds per horsepower at the 225 horsepower rating.

An unusual amount of study was devoted to exhaust valves and their operating mechanism, usually the greatest source of trouble in air-cooled radial engines. Collaborating with engineers of the Thompson Products Company, the matter of developing a cam design that would give the most efficient valve action, combined with rates of acceleration and deceleration that would put the least possible stress on the valve, received particular attention. The study carried from there through the entire mechanism to the valve itself, the valve guide and the optimum finning of the exhaust port. The result is, according to Thompson engineers, a valve operating condition which is the ultimate obtainable with present-day knowledge and materials and should give maximum possible insurance against trouble from valve sources.

The wide-spread and increasing use of radio, landing lights and other electrical equipment prompted offering battery ignition as standard equipment. On the engines with battery ignition, a generator is included as standard, the complete ignition system, including generator, weighing no more than a pair of magnetos. In addition to the saving of weight in ships requiring a generator for other purposes, there is the added advantage of lower idling speed and smoother acceleration due to the automatic spark incorporated in the distributors.

The construction of the L-4 otherwise follows conventional practice. The crankshaft, its front end with an SAE #20 spline, is of the two-piece clamp type design, machined and ground all over from selected chrome-nickel molybdenum steel forgings.



Power curve of the Jacobs L-4 engine

Cylinders are machined from a steel forging with closely-spaced fins, and the bore is ground and honed. Cylinder heads are aluminum alloy heat-treated castings, with rocker arm supports cast integral, while the head is screwed and shrunk on the steel barrel.

The exhaust valve stems are of chrome-nickel steel, hollow and are filled with a sodium solution. Intake valves have solid stems of the tulip type, and are of a special stainless steel. All valves are products of the Thompson Products, Inc., of Cleveland. Valve seats are machined from forged aluminum bronze and are shrunk into the aluminum cylinder head.

Cams, cam drive gears, valve tappets and push rods are located in the nose-section of the engine. The cams have three lobes and are run at one-sixth engine speed. Push rods, rocker arms, rocker arm bearings and valve springs are enclosed to prevent oil leakage.

Two springs made of special vanadium steel are used on both the intake and exhaust valve.

Rod and Piston Details

The master rod, of the one-piece type machined from a chrome-nickel molybdenum steel forging, is provided with a steel back special alloy-lined bearing shrunk into the rod.

Link rods are of forged aluminum alloy, and the piston pin and link pin holes are diamond-bored to a mirror finish. No bushings are used in the link rod, and the aluminum bears directly on glass-hard nitrided steel pins. The full floating piston pins are made of nitralloy steel and have aluminum end plugs.

In the forged aluminum alloy pistons, three ring grooves are provided above the pin and one below. The top ring is a one-piece compression ring; the second a two-piece compression ring; the third a two-piece combination compression and oil ring and the fourth a two-piece positive oil ring.

The crankcase assembly is built up of six parts, secured together by studs and nuts, and consists of a thrust bearing plate, which locks the thrust bearing and holds it in place; front case, made from a heat-treated magnesium alloy casting which carries the thrust bearing, cam, cam drive mechanism, tappet guides, and tappets and rollers; an aluminum alloy casting, which supports the front crankshaft bolt bearing; an aluminum alloy crankcase casting of the barrel type, having a rear wall cast integral which supports the rear main crankshaft bolt bearing, the rearward section of the crankcase incorporating a ringtype intake manifold; a cast aluminum alloy rear intermediate bearing plate, incorporating the oil feed bearing to the crankshaft and providing support for accessory drive gears which are under pressure oil feed and a cast magnesium alloy accessory case, providing suitable mounting pads for twin battery distributor units, fuel pump, oil pump, generator, starter and tachometer connections.

Two complete and separate distributor systems are used, incorporating automatic advance, which gives the correct retard for starting and idling and automatically advances the proper amount in relation to the engine speed. Distributor speed is half crankshaft speed, and either Bosch or Scintilla units are used.

Scintilla magnetos will be furnished in place of the distributor system, when specified by the purchaser, and the generator will not be standard equipment with magneto ignition.

Standard equipment includes B.G. 4B-1 spark plugs and the Stromberg Type NA-R7A carburetor.

The standard engine will be equipped for installation of direct drive electric starter (Eclipse or Bosch) or Heywood starter.

Engines equipped with magneto ignition will be prepared for installation of Heywood air starter.

The maximum fuel consumption is .55 lb. per b.h.p. per hour and 73 octane domestic aviation gasoline is recommended

The lubrication system consists of one pressure pump and one scavenger pump of the gear type, built into one complete unit. The pressure pump supplies oil to the accessory drive gears, master rod, and piston assemblies, cam bearing, and drive gears. Provision is also made to incorporate a take-off to operate controllable pitch propeller with oil pressure. Oil is consumed at the rate of .02 lb. per b.h.p. per hour.

The L-4 with carburetor, generator and ignition system, but without exhaust collector system, weighs 415 pounds. Its length from the end of the propeller shaft to the face of the mounting flange is 25.31 inches and there are eight .375 inch mounting bolts.

Specifications

Rated horsepower	225
Rated r.p.m.	2000
Bore	5.25 inches
Stroke	5 inches
Displacement	757 cubic inches
Compression ratio	5.375:1
Weight dry	415 pounds
Overall diameter	44 inches
Mounting bolt circle	16.5 inches

Static Tests of Transport Planes

● Tests conducted on a Boeing 247 transport of the type used by United Air Lines by the Materiel Division, Army Air Corps, Wright Field, Dayton, Ohio, revealed some interesting results.

In the static test, the plane was suspended from special supports and its fuselage piled with lead dust and shot until the structure buckled under the excessive weight. Although the required load factors were 5.25 for the rear section and 5.5 for the forward section, these parts did not fail until the load factors reached 8.75 and 8.50 respectively.

Fifty tons of lead were used to weigh the craft down, but it withstood the strain. Fifty-two tons broke the plane. The minimum safety requirements that had to be supported was 30 tons. The report shows that the body did not break under loading 60 per cent greater than the maximum load allowed under the safety requirements for these planes.

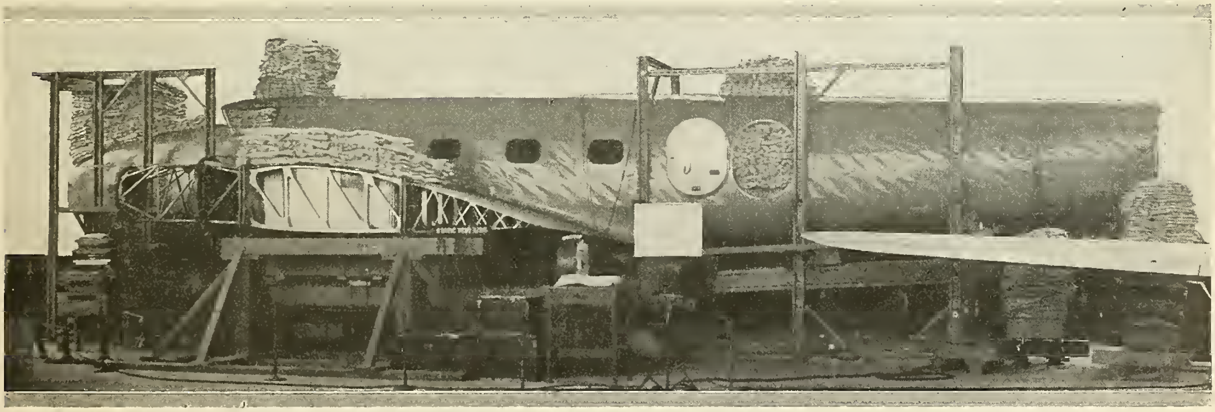
In addition, the tests were made on a basis of 13,650 pounds gross weight although the Department of Commerce approval calls for 13,100 pounds. Further tests showed torsion safety requirements 300 per cent in excess of those demanded by the Department while no metal fatigue or indications of duo-vibration of similar frequency which might set up harmonics considered dangerous, were discovered.

Tests on the wings of the plane showed that they could withstand weights of about 36 tons, 20 per cent above the minimum requirements, which indicated they could bear all stress and strain factors encountered in flight. The landing gear showed it could withstand an emergency landing impact of 32 tons, the equivalent of a free drop from a considerable height.

The plane tested was not a new one, but was taken from United Air Lines after 1,408 hours of service. Microscopic analyses of the metal in the plane showed no evidence of metal fatigue.

Flight tests, made by four army officers, were also satisfactory.

As a result of the fine showing made by the Boeing transport in these tests, the first of their kind ever made on transport plane equipment in the United States, it is understood that the manufacturer plans to install geared Pratt and Whitney Wasp engines equipped with three-bladed Hamilton Standard controllable pitch propellers to enable United Air Lines to speed up its schedules on its coast-to-coast system. General improvements in performance and a reduction in cabin noise are expected to result from the installation of the geared engines and new propellers.



Static load test at Wright Field of a United Air Lines' Boeing 247 transport fuselage

Stinson Model A Low-Wing Airliner

● The Model A, a high-speed, low-wing tri-motor airliner, powered with Lycoming R-680BA engines and designed to fill a new place in scheduled air transportation, will be placed in production by Stinson Aircraft Corporation early this spring.

When the design was begun in 1932, it was not the intention of the company to build a large transport for long haul transcontinental operation as all of their experience had been centered on smaller units for frequent short haul service. A survey of the situation at that time indicated the need for a fast tri-motor of good performance which would sell at less initial cost than the larger transports and operate for less cost per passenger mile.

These planes are intended for bad weather flying and night flights, but principally for use as high-speed "parallel feeders" for the big planes. This means that the Model A could handle the mail, passenger and express business from the intermediate cities now inadequately served by the large transport, due to the added costs of such stops and the reduced through speeds.

For example, high-speed service is now available from coast to coast, but the transcontinental planes do not stop at such important cities as Albany, Rochester, Dayton, Cincinnati, and others of equal importance. To furnish the same superior service to these cities, the Stinson Airliner could leave terminals an hour in advance of the transcontinental plane, stop at the intermediate cities, collect passengers and deliver them to a terminal at which the transcontinental plane made a regular stop, thus providing a service not now available.

The need for this type of Airliner is obvious to the operators of all major airlines in this country, with the exception of those interested only in the transcontinental routes. Some of the airlines also have routes which cannot support big planes and these will need smaller planes to do the job more economically.

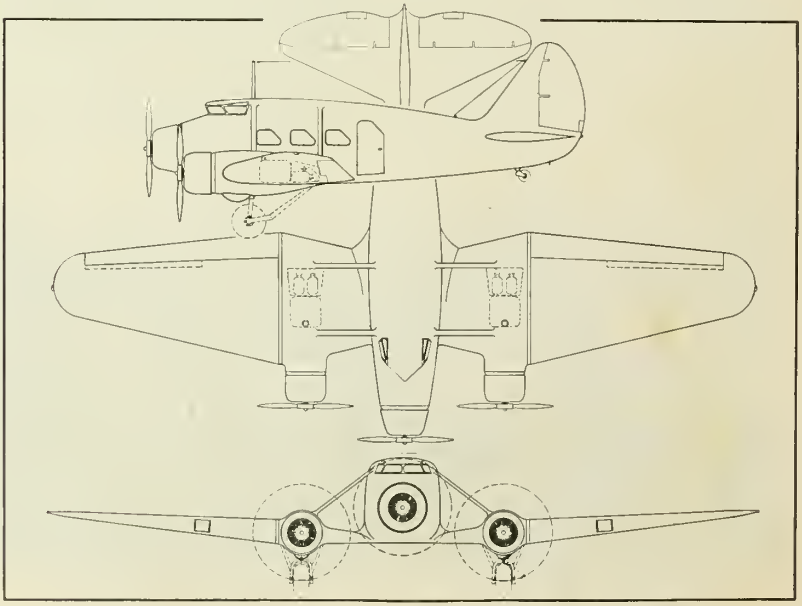
Many foreign countries must have modern, high-speed multi-motored airplanes. The new Model A Airliner meets their requirements because it does not have either the finances or traffic to support the big planes which are doing so well on the main traffic lanes in the United States.

The Model A is powered by three Lycoming nine-cylinder, radial engines rated 240 horsepower each at 2000 r.p.m. It is of low-wing design, with the inner section of the wings "gulled" and braced to avoid the use of the deep cantilever sections. The wheels retract into nacelles and the "speed arresters" (flaps) extend from nacelle to nacelle on the under-surface of the wings. They may be operated in unison with retraction of the wheels, if desired.

To complete this design, it was necessary to develop a new type of sesqui-spar cantilever wing which was originally considered in 1931. With this wing an accomplished fact, the balance of the airplane did not deviate to any great extent from standard construction practice as the entire structure is of chrome-molybdenum tubing, welded and heat treated in the same conventional manner as the other Stinson tri-motored Airliners.

Engines are aproned with metal within the exhaust areas, this being several feet back of the cylinder heads and out from the center line. The remainder of the structure is fabric covered.

Special attention has been given to seating comfort, vision, quietness, ventilation, heating and other modern airline prerequisites. The insulated cabin has adjustable hammock-type chairs for eight people, four of whom may face to a com-



Three-view outline plans of the high-speed Stinson Model A Airliner mon center for bridge games or luncheon. Individual heating, ventilation and lighting are provided. The baggage compartment, to the rear of the cabin, is accessible from the inside, but is loaded from the outside. Additional mail space is provided in the nacelles, a commissary furnished, and a well-appointed lavatory located in the extreme rear of the cabin.

The cockpit is made comfortable for pilot and co-pilot (if the latter is required on service of this type) and all controls are within handy reach and easy to operate. Vision is excellent. A hatch located over the cockpit is fitted with a large rear vision mirror for use principally while taxying.

The Smith controllable pitch propellers are operated in unison by a device which is practically automatic after take-off, if the pilot so desires. This feature simplifies synchronization of the engine revolutions.

Instruments and Equipment

Standard equipment also includes: Sperry horizon, Sperry gyro, standard flight and engine instruments (all on dash-board), electrically-operated landing gear, 25 amp. generator, Pyrene fire extinguisher equipment, landing lights, airwheels and hydraulic brakes.

Extra equipment includes stewardess facilities, two-way radio and mast, reversible chairs, cabin air cooling, international 3-minute flare, three 1½-minute flares, Goodrich de-icer equipment and dual controls, Lux fire extinguisher equipment, engine-driven vacuum pump, adjustable booster brake control, and heated airspeed pitot head.

Dimensions and other data are as follows:

General Specifications

Wing span	60 feet
Length	36 ft. 10 in.
Height (including radio mast)	14 ft. 2 in.
Power, total	720 H.P.
Power available for cruising	540 H.P.

Weights (Pounds)

Useful load	3080
Pay load	1860
Eight passengers	1360
Baggage and mail	500
Gasoline, 140 gals. (128 with co-pilot)	840
Oil, 12 gallons	90
Co-pilot or stewardess	170 or 120
Pilot	170
Gross weight	8750
Wing loading (per square foot)	17.5
Power loading (per horsepower)	12.2

Areas (Square Feet)

Wings	500
Ailerons	53.5
Flaps (at 60°)	41.6
Horizontal tail surfaces	105
Vertical tail surfaces	35

Performances

Cruising speed at 5000 feet	150 m.p.h.
Cruising speed at 1000 feet	146 m.p.h.
Climb at sea level, wheels up—	1060 ft. per min.
Climb at sea level, wheels down—	935 ft. per min.
Range with 35% excess fuel	370 miles

Recent Patents

The following patents of interest to readers of AERO DIGEST recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

Selective pitch propeller. Louis J. Kozub, Pittsburgh, Pa. (1,936,677)

Propeller. Lionel M. Woolson, Detroit, Mich., assignor to Packard Motor Car Co. (1,936,702)

Aircraft with rotative sustaining blades. Juan de la Cierva, Madrid, Spain, assignor to Autogiro Co. of America. (1,936,752)

Aircraft wings. Albert Gebhert, Seattle, Wash. (1,936,786)

Fuel tank for aircraft. Michael J. Kaplan, Baltimore, Md., assignor to B/J Aircraft Corp. (1,937,086)

Parachute flare. Louis J. Driggs, Jr., Tippecanoe City, Ohio. (1,937,191)

Method of obtaining supporting power for aircraft. Fritz Waap, Dresden, Germany. (1,937,212)

Airplane instruction device. Theodore M. & John L. Pardue, St. Louis, Mo. (1,937,241)

Cockpit cover (aircraft). Walker W. Lightner, U. S. Navy. (1,937,520)

Method of making topographical maps. Douglas H. Nelles and Joseph O. Fortin, Ottawa, Ont., Canada. (1,937,711)

Propeller for aircraft. Hugo Junkers, Dessau, Germany. (1,937,966)

Seaplane landing float. William B. Mayo, Detroit, Mich., assignor to Ford Motor Co. (1,937,973)

Helicopter. Alberto Wick, Buenos Aires, Argentina. (1,938,091)

Airplane with supporting surfaces of variable area. Ivan Mackhonine, Paris, France. (1,938,148)

Airplane construction. Walter E. Sochrman, Chicago, Ill. (1,938,156)

Airplane. Alfred A. Braley, Midland, Mich. (1,938,171)

Aircraft: Gardner T. Voorhees, Boston, Mass. (1,938,234)

Cooling system for aeronautical engines. Walter F. Davis, Farmingdale, N. Y. (1,938,537)

Airplane parachute releasing means. Ronert J. Miller, Milwaukee, Wis. (1,938,853)

Aerodynamic instruction and testing apparatus. William F. Gerhardt, Grosse Ile, and Clarence A. Brock, Detroit, Mich., assignors to Curtiss-Wright Flying Service, Inc. (1,939,047)

Airplane. Jacob Klein, New York, N. Y. (1,939,061)

Harness for aviators. Samuel H. Knight, Lancaster, Pa. (1,939,062)

Mapping camera. Charles F. Jenkins, Washington, D. C., assignor to C. Francis Jenkins, Inc. (1,939,172)

Aircraft construction. Sidney P. Lyon, Kenmore, N. Y. (1,939,506)

Aircraft structure. Flavius E. Loudy, Akron, Ohio. (1,939,558)

Aerofoil beam. Earl J. W. Ragsdale, Norristown, Pa., assignor to Edward G. Budd Mfg. Co., Philadelphia, Pa. (1,939,599)

Gyroscopic horizon indicator. Frederick C. Narvesen, East Rockaway, and Bert G. Carlson, Elmhurst, N. Y., assignors to Sperry Gyroscope Co. (1,939,825)

Means for facilitating take-off and landing of aircraft and refueling them. Theodore E. Steiber, Bridgeport, Conn. (1,940,030)

Flying machine. Roger J. Sweet, Buffalo, N. Y. (1,940,108)

Variable pitch propeller. Frank J. Wingler, Detroit, Mich. (1,940,200)

Airplane fabric. Guy C. Given, Harold W. Letts, and Norman W. Thomson, assignors to E. I. du Pont de Nemours & Co., Wilmington, Del. (1,940,212)

Propeller. John Squires, Hagerstown, Md. (1,940,333)

Airplane. Lessiter C. Milburn, Towson, Md., assignor to Glenn L. Martin Co., Baltimore, Md. (1,940,555)

Form for making aircraft fuselages. Ralph D. Weyerbacher, Commander, Construction Corps, U. S. Navy. (1,940,830)

Retractable landing gear. Robert W. Ayer, Wayne, Mich., assignor to Manning & Co., Chicago, Ill. (1,940,836)

Automatic variable pitch propeller. Dimitri S. de Lavaud, Paris, France. (1,943,210)

Heating and ventilating system (for aircraft cabins). Myron G. Beard, Farmingdale, N. Y., assignor to Aviation Patent & Research Corp. (1,943,233)

Light-weight girder for aircraft. Ludwig Durr, Friedrichshafen, Germany. (1,943,256)

Apparatus for determining course and speed of aircraft. Rene Rinerolles, Paris, France. (1,943,397)

Cowling ring and airplane engines. Harold A. Hicks, Detroit, Mich., assignor to Ford Motor Co. (1,943,528)

Airplane landing light. Samuel W. Hyatt, Columbus, Ohio. (1,943,609)

Landing gear. Giuseppe M. Bellanca, New Castle, Del. (1,943,783)

Shock-absorbing strut for airplanes. Raymond E. Dowd, Staten Island, N. Y., assignor to Russell Mfg. Co. (1,943,887)

Cargo handling apparatus for aircraft. Manuel Castro, Canton, Ohio. (1,944,000)

Flight trainer. William E. Huffman, Dayton, Ohio. (1,944,180)

Advertising apparatus. Kenneth N. Moir, Los Angeles, Calif., assignor to Aerial Advertising Co., San Francisco, Calif. (1,944,448)

Gas bag envelope for aircraft. Elmore E. Sabin, Oakland, Calif. (1,944,467)

. NEW EQUIPMENT and METHODS .

Blind Flying Instrument

• A NEW instrument which successfully aided Department of Commerce pilots in practicing blind landings is expected to go far in increasing the regularity and dependability of air travel. A development of the use of the blind landing system perfected by the Aeronautics Branch, this instrument is a simple dial mounted on the instrument board of the plane to the left of the artificial horizon.

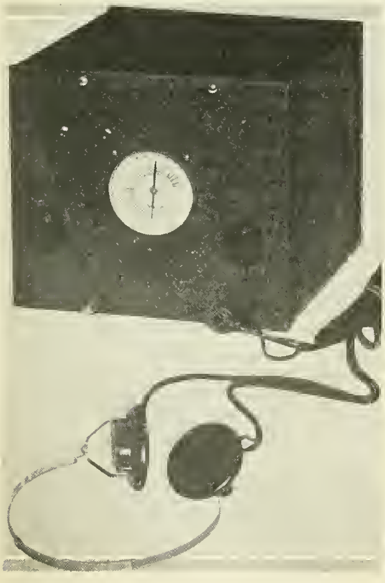
On the dial are two radium painted needles; on the face of the glass, two rows of illuminated dots, one perpendicular, the other horizontal. The needles and dots show the position of the plane in relation to the invisible bent radio beam sent out on a 5-meter wave length over the transmitting system.

If the needles are at right angles, the pilot, regardless of weather conditions, need make sure by his regular blind flying instruments only that his plane is on an even keel, thus assuring himself of a landing on the airport along the path of the beam.

Perfection of the instrument is credited to engineers of Transcontinental & Western Air, Inc., including Douglas Lakouta, radio technician.

Crosley Radio Sets For Aircraft

• AN EXTREMELY sensitive 5-tube superheterodyne set of the dual range type, embodying latest developments in radio design, many of them exclusive features, has just been introduced by Crosley Radio Corp., Cincinnati, Ohio, for use in aviation.



Dual range Crosley aircraft radio

Called the Crosley Air Roamio, the receiver is light in weight, compact and lends itself to easy installation in aircraft. Its engineers claim simple tuning, power, selectivity and sensitivity. Its frequency range includes beacon and meteorological broadcast channels, and by means of a switch, the standard broadcast band of from 540 to 1,700 kilocycles can be obtained. Any number of head-sets can be attached.

A type "B" eliminator, employing no tubes, bearings, brushes or other high-speed parts not only reduces the weight but also the size of the chassis and is an exclusive feature known as the Synchronode Power Unit. The set is designed to operate with one 12-volt aircraft storage battery, but it also can be operated with one 6-volt battery, the difference in current being taken up by additional amperage drain.

The Roamio is easily mounted, weighs 19 pounds 6 ounces and measures 6½ by 7 by 8 inches.

Simultaneously with the announcement of the Roamio, another set, known as the Crosley Ground Station Radio was introduced. This superheterodyne machine has seven tubes, the dual range feature permitting reception on both long and short waves and is housed in an attractive grained walnut and burl maple cabinet.

Westport Airport Radio Receiver

• THE NEW Westport airport radio receiver, a five-tube, two-band superheterodyne unit weighing 12 pounds and covering the Department of Commerce weather, range beacon and entertainment broadcast frequencies, has been introduced by Westport Manufacturing Co., Glendale, Calif., as a companion to a line of aircraft radios.

It is equipped with a self-contained dynamic speaker and is housed in an attractive, modernistic laminated wood cabinet, measuring 11½ x 6¼ x 8 in. A positive band selector (wave changing) switch, a volume control and a.c. switch, and an illuminated vernier tuning dial appear on the face of the cabinet. The cadmium-plated steel chassis carries individual aluminum shielding for three of the tubes.

Operating on 110-volt, 50-60 cycle current, the receiver has low power consumption and high output.

Greater Sensitivity In Instruments

• DEVELOPMENTS IN instruments giving scale deflection of 0-20 microamperes and 0-3 millivolts have been announced by Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pennsylvania. These refinements are the result of reduction in weight of moving parts; a 3:1 increase in magnet strength and a 6:1 increase in the possible number of turns on the moving coil (applied chiefly to microammeters). This sensitivity was achieved by making relatively slight improvements in many of the fundamental parts of the instrument.

These instruments are 2 inches or 2⅞ inches in body diameter, giving full scale deflection on one or two micro-watts. The lowest standard micro-ammeter has a scale 0.20 micro-amperes, and a coil resistance of about 2100 ohms.

Small millivoltmeters of hitherto unattainable sensitivity are available with scale of 0:3 millivolts with a resistance of about 9.1 ohms. A high resistance microammeter has been designed to measure the voltage produced by dissimilar metallic electrodes in extremely weak solutions, such as drinking water. For special requirements, a very highly damped instrument can be obtained by use of the cobalt steel magnet.

Armco Stainless Steels for Aircraft

• ARMCO STAINLESS steels manufactured and distributed by The American Rolling Mill Co., Middletown, Ohio, in sheets, strips, and plates, will be offered in two different grades, Armco 17 and Armco 18-8, the latter popular in aircraft use.

Armco plants have been producing stainless steel in the forms noted for many months for the Rustless Iron Corp. and these products have been used by a number of manufacturers who have cooperated by keeping careful records of the performance under actual production conditions. Performance under the dies has demonstrated unusual ductility and formability, both of which have resulted in lower tool expense.

Both production and sales are under the direction of men who have had wide experience with stainless steels. A Stainless Steel Sales Department has been created, with J. P. Butterfield, formerly manager of the Armco Development Department, in charge. He will be assisted by E. E. Jones. Production in the different plants is under the supervision of Ralph E. Curry and W. L. Woodward, both of whom are assistants to the vice-president in charge of operations.

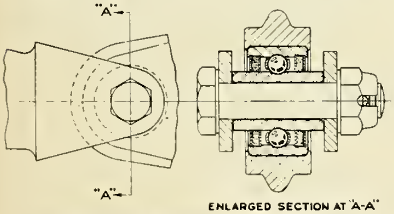
Portable Metal Cutting Machine

• A LIGHT weight portable cutting machine, known as the Secator, has been announced by The Linde Air Products Co., New York, as an addition to its Oxweld line of apparatus.

Essentially, it consists of a specially designed blowpipe mounted on an electrically driven, air-cooled, dust-proof chassis. It is equipped with a direct drive and runs either on a 1½ inch angle-iron track, furnished with it, or on any relatively smooth plate. When operated on the track, it does straight-line cutting automatically. For cutting simple shapes it can be guided with a hand-grip. For automatic circle-cutting, a center and a radius rod are furnished. For control, the oxygen and acetylene valves are on the chassis rather than on the blowpipe. The blowpipe can be adjusted vertically and horizontally and also to cut bevels to 45 degrees.

Precision Bearings For Aircraft Controls

• AMONG THE specially-designed ball bearings for aircraft usage is the complete line of 15 types recently introduced by the Norma-Hoffmann Bearings Corporation, Stamford, Conn., manufacturer of precision ball, thrust and roller bearings. Offered in a choice of either single or double row units in both radial and self-aligning types, these bearings are made in both inch and metric sizes, equipped with single or double metal shields, or without shields as desired. Certain types have extended inner rings which make spacing washers unnecessary. Cadmium plating of all exposed surfaces makes them rust-resistant.



Felt-protected single-row ball bearing

Bearings are made from the finest alloy steels, scientifically heat-treated to assure maximum hardness and toughness. The metal seal and felt seal types made by the company lend themselves especially well to controls because they are grease-packed to last the normal life of the ship and are equipped with protective closures guarding against moisture, dirt and other foreign matter. The felt-protected single-row ball bearing illustrated here is firmly held in the grooves of the outer ring, consisting of a thick felt washer interposed between two split washers and a solid closing washer. The felt rides upon the inner ring so that the seal effectively retains the lubricant and affords adequate protection against moisture and foreign matter. This type, known as XA-44, has a bore of ¼", an outside diameter of ¾" and weighs .052 lb. It will stand a maximum static non-Brinnell load of 600 lbs. radially and 480 lbs. thrust.

RCA Aircraft Radio Beacon Receiver

• THE RCA Victor Model AVR-2 aircraft radio beacon receiver, developed specifically for use in aircraft, provides radio beacon reception, airways weather report reception and traffic control instruction reception by operating in the frequency band of 200 to 410 kilocycles.

The receiver is so designed and constructed that it is applicable to any aircraft. While primarily designed for remote control usage, the AVR-2 is readily adaptable to local control where it is necessary to locate the radio receiver within the cockpit or cabin. This installation only requires mounting of the control box on the receiver chassis and elimination of the flexible control shaft and electric cable which connects the two units on a remote control installation.

The entire power supply is derived from the standard aircraft 12-volt storage battery, but can also be supplied to operate from a 6-volt storage battery. The Superheterodyne circuit adapted in an extremely compact and reliable design makes available a high degree of sensitivity and interstation selectivity, together with overall stability and nearly uniform performance over the complete tuning range.

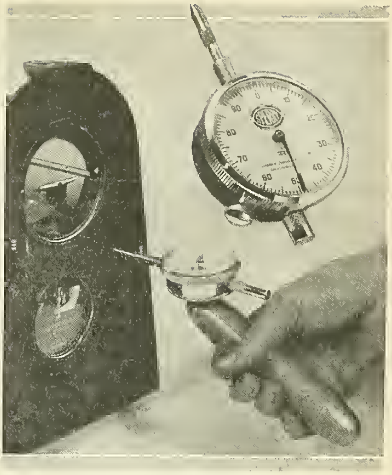
Other features include: continuous variable tuning over the entire frequency band; only small antenna required, preferably of mast or "T" type; combined "on-off" switch and manual volume control providing ease of adjustment in radio beacon flying and satisfactory intelligibility of weather broadcasts under all atmospheric conditions.

Equipment includes a crank type tuning control; indirectly lighted and calibrated dial; twin phone jacks and rugged dynamotor-type power-unit.

The AVR-2 provides extreme sensitivity with minimum background noise, through the use of specially designed circuits and complete shielding; high selectivity and faithful signal reproduction.

A power output of approximately 1½ watts assures strong signals when desired and as required, while complete shock-mounted and vibration-proof construction insures years of operation.

Installation in aircraft is simple, requiring only mounting of receiver, control box and power unit, plugging in of electric cables, insertion of flexible control shafting and connection of antenna, ground and 12-volt power supply.



Sperry vibration tester

Vibration Tester For Instruments

• INNUMERABLE TESTS by the engineers of the Sperry Gyroscope Company have shown that the delicate airplane instruments function correctly only if the amplitude of the instrument panel vibration is less than four-thousandths of an inch. To test and then overcome vibration in an instrument panel they developed first of all, a simple vibrometer to measure the amplitude of vibration.

It consists of a relatively heavy handle (about five pounds in weight) and a precision indicator gauge graduated in thousandths of an inch. When measuring the vibration, the instrument is held in the hand and the end of the shaft is lightly pressed against the panel. The hand of the observer, weighed down by the heavy handle of the vibrometer, has sufficient inertia to be considered as immovable in space. As the panel vibrates, the shaft of the vibrometer will follow the panel faithfully and the pointer will describe an arc. Since the pointer moves at a speed of about 30 oscillations a second, the arc appears as a solid grayish section and can be easily read against black graduations on the white dial. With a little training it is possible to read as close as .0005 of an inch.

With the average vibration amplitude of an instrument panel ascertained at about .020 of an inch, or five times more than is considered permissible, the engineers decided that the instrument mountings violated the fundamental principles of vibration engineering and had too high a frequency of free vibration. A rubber mounting was then designed with the panel mounted entirely through bonded rubber units which are put in shear by vibration. The center of gravity of the panel is in line with the rubber mountings and the insulation units are compact, small and easily installed.

Personairlities

Cy Caldwell

● F. WILLIAM ZELCER entered aviation through the hotel business, an excellent way to enter. For if you're interested in aviation and own a hotel, you always have a place to eat; but if you're merely interested in flying, and don't own a hotel, eating sometimes becomes a problem, as many an old pilot can testify. Many's the time, in the days of my youth, I'd have been glad to let the science of aviation go on without me, while I returned to my hotel. Only, I didn't own a hotel; I didn't own anything, or I'd have gone back to it, and let some one else wrestle with a Fox two-cycle marine engine in a home-made Curtiss—a very unhappy combination.

But Bill has never had to make a living out of aviation, so it's all a whale of a lot of fun to him—as much fun as owning a hotel would be to me, if I owned one, and I could eat and drink in it for nothing. You see, Bill is a Sportsman Pilot, a fellow who loves to pay for doing what we old commercial pilots only did when we were paid to do it. When they start erecting monuments to aeronautical pioneers, I'm going to suggest that some one put up a statue to the Early Sportsman Pilot, complete with fountain pen and checkbook. His contribution to aviation has been substantial and unappreciated.

Bill Zelcer was born Nov. 15, 1897, in New York City. He is one of the few New Yorkers actually born here; most of us were born elsewhere and only came to New York in desperation. We have a very low birth rate here, anyhow, as there is so much to do in the evenings that hardly any one stays at home long enough to get a family started. The birth rate went up slightly during the Depression, as many of us were too broke to go out anywhere. All this counted against Mr. Hoover when he tried to get elected.

Anyhow, Bill was born during the panic of '97, thus adding to the confusion of those times, was educated in the grade and High Schools of New York, and polished off at Brown University in Providence. In 1916 he played end on the Brown football team that beat Yale and Harvard on two successive Saturdays, but as everybody was continually beating Yale and Harvard this went practically unnoticed except by Bill, who still takes great pride in it. He is a very husky chap and to this day could make a touchdown either with a football or with one of the opposing team—he wouldn't care which.

Bill worked his way through college by getting jobs in early school days and during vacations, in the hotel business. So after he graduated he naturally turned to that business, working in many of the leading hotels in New York City, such as the Waldorf, Knickerbocker, Astor, and Commodore, usually as clerk or assistant to the managers. He spent three years as assistant manager of the Greenbrier at White Sulphur Springs, where the elite go to take the baths and loaf through the winter. All this time he was just a hard-working hotel clerk, catering to the whims of travelers, many of whom weren't used to anything at home, but who, when they stayed at a hotel, expected as much attention as Queen Marie of Roumania. A hotel clerk is just about the most patient and long-suffering human there is; hardly any of them have been known to kill a guest, even though he deserved it, and asked for it.

Now, here comes the Oliver Optic part of this yarn—from Rags to Riches, or Patience and Virtue Rewarded. Bill became manager of a small hotel named the San Rafael—he was progressing, you see—and in that hotel was a wealthy guest who was always grouching about something: the rates were too high, the food too bad, or the sheets were too short. He'd have moved, only he had found something wrong everywhere. Finally Bill said to him, "Why don't you buy a hotel, Mr. Kittredge? Give me a third interest and I'll run it for you. Then you'll have no rent to pay, and free food to boot." Well, the idea appealed to the old gentleman, and the first thing Bill knew he had a third of the Hawthorne, and was doing well with it. Even the hotel's situation was lucky, for it was built in the middle of what John D. Rockefeller, Jr., decided was the spot to build Rockefeller Center. So they sold the hotel and the Roxyettes now dance where it used to be. I'll bet Mr. Rockefeller wishes he'd left the hotel there.

Bill Zelcer, the resting restaurateur

Anyhow, that gave Bill his start, and the Prohibition people helped him along by closing up and padlocking the Piccadilly Restaurant on 45th Street. Bill decided to open up a swell restaurant right across from where the Piccadilly had been flourishing like the green bay tree. He called it Ye White Horse Inn, and designed the front and interior decorations from pictures out of old books about old English Inns. He did all of this designing and even wired the place himself. The result is the most comfortable and delightful old English tavern I've ever been in—and I've wined and dined and been thrown out of some of the most famous old inns of England. The White Horse is at 114 West 45th Street in New York, and for superb food and the best drinks in town I recommend it heartily to all visiting aviation people.

For years Bill had been interested in aviation, but it wasn't until the White Horse got doing well that Bill felt he could take the time from business to go in for sport flying. In 1927, while stuck in a Sunday traffic jam on his way to a Westchester golf club, a plane flew overhead, reminding Bill that the quickest way to get anywhere on Sunday was to get above the roads. Next day he went out to Roosevelt Field and became the first student at the Roosevelt School, learning in Fleets with Ray Cullman. He has been flying ever since, and now has over 1,800 hours, which is quite a few for a tired business man. He has flown all of the light types, and the Fairchild 72, Sikorsky, Loening Commuter, all types of Bellancas, and Wacos and Stinsons. He has owned a J6 Aristocrat and now has a Laird Speedwing, which he redesigned and rebuilt, raising the speed from a factory top of 160 to its present 185 m.p.h., which is going some for an amateur designer of old English inns. He was winner of the Leeds Trophy Race from New York to Cleveland in 1933, and won the First National Sportsman Pilot Championship in the National Air Pageant last year.

He married Bonnie Glass, famous star of the theatre and one of the most charming ladies I have met. In fact, Bill has had a lot of luck all around, and is a very happy and cheerful fellow. He is a member of the Aviation Country Club and does most of his flying at Hicksville, L. I. A short while ago he took my little son and myself for a flight over the island. It was the baby's first flight—he's just two and a half years old—and from the moment we left the ground until we landed again the youngster peered out of the Waco cabin plane and laughed and laughed. Of course, I've always known that this aviation is a funny business, but I was startled to see that one so young was aware of its essential humor. After about ten minutes little Boze, as I call him, looked up at me and said, "Daddy! Bird-bird!" Then he laughed more than ever; he got the idea, all right. Some day I must let him see Pete Brooks stunting, and landing by mistake on his back; Boze will laugh himself into hysterics. But I won't show him Hiram Bingham until he's older and stronger; I don't want him to have convulsions.

* * *

● THE SMITHS comprise a very large family. The *Encyclopaedia Britannica* is a very large book in which you will find records of some 200 of the most famous members of that multitudinous tribe. You'll find Adam Smith, an expert on money; Al Smith, an expert on fish, boloney, and politics (which go together very comfortably); you'll find John Smith, a minister who preached very dreary sermons, and William Smith, a mere writer like myself, only duller, if that is possible. You'll even find Smith & Wesson, who make weapons for killing people with. But if you hunt for a Smith whose inventions have been responsible for saving over 800 lives from aircraft, you won't find him. His name is James Floyd Smith, and he is President of the Floyd Smith Safety Chute Co., Buffalo, N. Y. He invented, developed and patented the first successful free type of manually operated parachute which was later adopted and is now used by the U. S. Army Air Corps and the governments of 26 countries as standard equipment of their aircraft.

Floyd Smith and his famous chute

Of course, the parachute is the oldest means of aerial support known to history—it antedates the balloon or the airplane by centuries. Leonardo di Vinci mentions it in 1495, and describes how one should be made, concluding that the user may "be able to let himself fall from any great height without danger to himself." This idea possibly was conceived to enable gentlemen to escape from second-story windows in case of fire or the unexpected return of the lady's husband.

In his interesting book, "Jump," Don Glassman records parachute jumping from a tower by an acrobat in Siam, in the year 1687; and the *Encyclopaedia* states that one Sebastian Lenormand jumped from a high observatory in France in 1783. It also says that a Frenchman named Andre Garnerin descended in a parachute from a balloon Oct. 22, 1797. And to this day Frenchmen would sooner jump from balloons than pay any of their war debt to the United States. But we're wandering. What I'm getting at is that Floyd Smith didn't invent the parachute, but he did invent the first safe means of getting out of an airplane with a parachute; and that is the manually-operated rip cord which all airplane parachutes use today.

This old inventor of the jump, pull, and hope to God system was born in Geneseo, Illinois, Oct. 17, 1884. He was partially educated in the public schools of Union, Ore. and San Diego, Calif., but left before modern education had stunted his mental growth with a college course. He became a cow-puncher, and his first flights were made from the back of a discontented cow-pony who had read Kipling and whose belief was that "whether down to Gehenna or up to the throne, he travels the fastest who travels alone." Floyd fled from the backs of so many bronchos that it dawned upon him that some means of checking his descent should be devised. This turned his thoughts to parachutes. Besides, he had lit on his head several times and naturally began to think like a modern exhibition parachute jumper, though he didn't know it at the time. But it was all helpful, because if he had remained normal he'd have become a stock broker and left parachutes to someone like Roger Don Rae.

As it was, he became so unsettled at first that he became a machinist, an orange grower, worked in a sugar factory, and finally became an aerialist, a member of the famous Flying Sylvesters, who toured the country in various circuses and vaudeville theatres for years. The one who fell out of the net was Floyd; that helped him, too. In 1907 he had married Miss Hilder F. Youngberg, putting her in the act and tossing her casually through the atmosphere of the circus tent. He chucked Mrs. Smith around for five years, sometimes letting her overshoot the net and fall to the ground, just for variety.

Jan. 15, 1912, Floyd started to build the Smith tractor biplane at Santa Ana, Calif., with Mrs. Smith building ribs, sizing and shellacking all surfaces. His first hop was on June 1, 1912, and he gradually learned to fly. After six days of practice he took up his first passenger, the brave Mrs. Smith, sitting on a board with no net under her. She survived. So did Charles (Chuck) Day, his next passenger. On July 20 he flew with Mrs. Smith from Santa Ana to Griffith Park, a distance of 47 miles, in 1 hour 7 minutes, a speed record. He was now a finished aviator, practically an expert, and in August, 1912, was booked to fly at Overland Park, Kansas City, with Art Smith, Bud Morris, and Bob Fowler, star aviators of the old days.

After barnstorming for a year, Floyd went broke, became a mechanic in Glenn L. Martin's factory, soon became chief pilot. Early in 1914 he jumped a Martin-Broadwick chute, an attached type. Two days later Glenn flew Mrs. Smith out over Los Angeles harbor and she stepped off, went into a spin, the shroud lines tangled, and she fell about 400 feet before the parachute opened completely. In May, 1914, Floyd Smith, yearning to be the third pilot to loop in the United States, wanted Mrs. Smith to come along and sit in his lap while he flew for fame. She got a hunch, and stayed behind. That was one of the best ideas Mrs. Smith ever had. Floyd went up and looped and looped—a wing and aileron crumpled and he spun to the ground. But you can't kill a parachute man in an ordinary airplane crash—he bounces. Thus you see that early aviation was a most delirious affair; no wonder that yokels thought the early birdmen were slightly demented.

Until 1917 Floyd Smith was test pilot for the Martin Co. During that time he delivered a plane to Pancho Villa in

(*Continued on page* 72)

. AIRLINES and AIR TRAVEL .

Air Mail Contracts Cancelled

ON FRIDAY, JANUARY 9, 1934, Postmaster General James A. Farley annuled all existing air mail contracts and President Roosevelt ordered the Army Air Corps to carry the mail under the existing emergency. Charges of fraud and collusion in the award of the original contracts during the tenure of office of Postmaster General Walter F. Brown prompted the action after an investigation by a committee of which Senator Hugo Black is chairman had brought to light the alleged existing conditions.

It was intimated in Washington that contracts would be relet on new terms and conditions to all but three of the operators, but an effort to ascertain which three would be outlawed met with no success.

In most instances, however, operators said they would carry on their passenger and express business and promised not to discharge personnel unless it became absolutely necessary to do so in the interest of enforced economy. Contracts for new equipment in most cases also would be fulfilled, it was reported, and the airlines said they would take all the new planes contracted for.

Eastern Air Transport, however, announced curtailed schedules reducing the number of cities served from twenty to seven and the number of miles scheduled daily from 10,500 to 5,800. It is also understood that some employees will be taken from the payrolls. Transcontinental & Western Air, Inc., also announced curtailed schedules and an unlimited furlough for all its employees, and said only one round-trip from New York to Los Angeles will be maintained. On the other hand, however, American Airways and United Air Lines both promised they would continue their services without any curtailment of flying schedules and in the case of the former, orders for more than $2,000,000 worth of flying equipment will stand.

Under a rearranged plan, some cities which formerly had been receiving air mail service would be without it. The Army will fly between Chicago and San Francisco, Chicago and Dallas, Salt Lake City and Seattle, Salt Lake City and San Diego, Washington and Cleveland, New York and Chicago, New York and Miami, New York and Atlanta, New York and Kansas City, Cleveland and Fort Worth, Chicago and Jacksonville and Cheyenne and Pueblo. In addition schedules will be maintained between New York and Boston, Atlanta and New Orleans and Toledo and Detroit. A map showing the route and key cities is on page 20 of this issue.

FLOYD BENNETT FIELD EASTERN OFFICE FOR ARMY AIR MAIL

NEW YORK'S Municipal Airport, Floyd Bennett Field, has been made the executive headquarters of the Eastern air mail zone and will base Major B. Q. Jones, the zone commander and his staff of officers superintending the handling of the mail to and from the New York area. Newark airport, however, will for the time being at least, continue to be the flight center with actual handling of the mails done at that field. Twelve officers and 30 enlisted men have been assigned to aid Major Jones in directing the operations of the planes coming and going to Newark.

Two hundred officers, 324 men and 122 planes were included in the initial assignment as worked out by the Post Office Department and submitted to Major General Benjamin D. Foulois, Chief of the Army Air Corps, who completed details for servicing the routes. The country is divided into three areas, known as Eastern, Central and Western with operations centered at Newark and Floyd Bennett Field, New York under Maj. B. Q. Jones, at Chicago under Lieut. Col. H. M. Hickham and at Salt Lake City under Lieut. Col. H. H. Arnold, respectively.

Meanwhile, Congressional leaders outlined a plan for a new air mail policy. This included a new rate structure with air mail carriage placed on a definite fixed price basis and eliminating the present space basis.

Fleet of new P. & W. Wasp-powered Lockheeds for Northwest Airways

Boeing Transports Speeded Up

WHILE A FINAL performance report has as yet not been made, considerable increase in the speed of the Boeing 247 transport has been achieved through installation of geared Wasp engines equipped with three-blade controllable pitch propellers. It is understood that Boeing officials and officers of United Air Lines are satisfied with results of tests with the first of the re-equipped Boeings

The cruising speed without the gearing was 171 m.p.h. and as an increase in cruising speed is indicated, it is evident that United Air Lines will shortly be in a position to cut its present 19½-hour coast-to-coast service, set up before controllable propellers or gearing were decided upon. Also, United's coast-to-coast flight includes 12 to 14 stops and on speed schedules it could reduce these to cut an hour and a half from the present schedules without any consideration of the increased speed afforded by new type engines.

The gearing of the 550 h.p. supercharged Wasp engines and the installation of three-blade controllable pitch propellers is responsible for general improvement in the plane's performance as well as material reduction in cabin noise.

1933 Traffic Highest in History

SCHEDULED AIRLINES in the United States flew more miles and carried more passengers and express in 1933 than in any other year since the airplane became a part of the nation's transportation facilities, according to Eugene L. Vidal, Director of Aeronautics of the Department of Commerce.

Domestic airlines carried 493,141 passengers as compared with 474,279 in 1932. Merchandise and other articles dispatched by air express amounted to 1,510,215 pounds, an increase over the 1,033,970 pounds carried in 1932. Miles flown were 48,771,553 in 1933, compared with 45,606,354 in 1932.

Passenger miles flown increased at a greater rate than the actual number of passengers, indicating longer journeys per passenger. A total of 173,492,119 passenger miles was recorded in 1933 as against 127,038,798 in 1932.

Reports for December showed that 26,711 passengers and 172,854 pounds of express were carried on the domestic lines during that month. The lines flew 3,385,886 miles and 10,410,709 passenger miles during December. Reports were received from all of the 24 companies operating during the period, and it is to be noted that the entire 1933 report includes only domestic lines, as reports of traffic on foreign extensions are not yet complete.

(Continued on following page)

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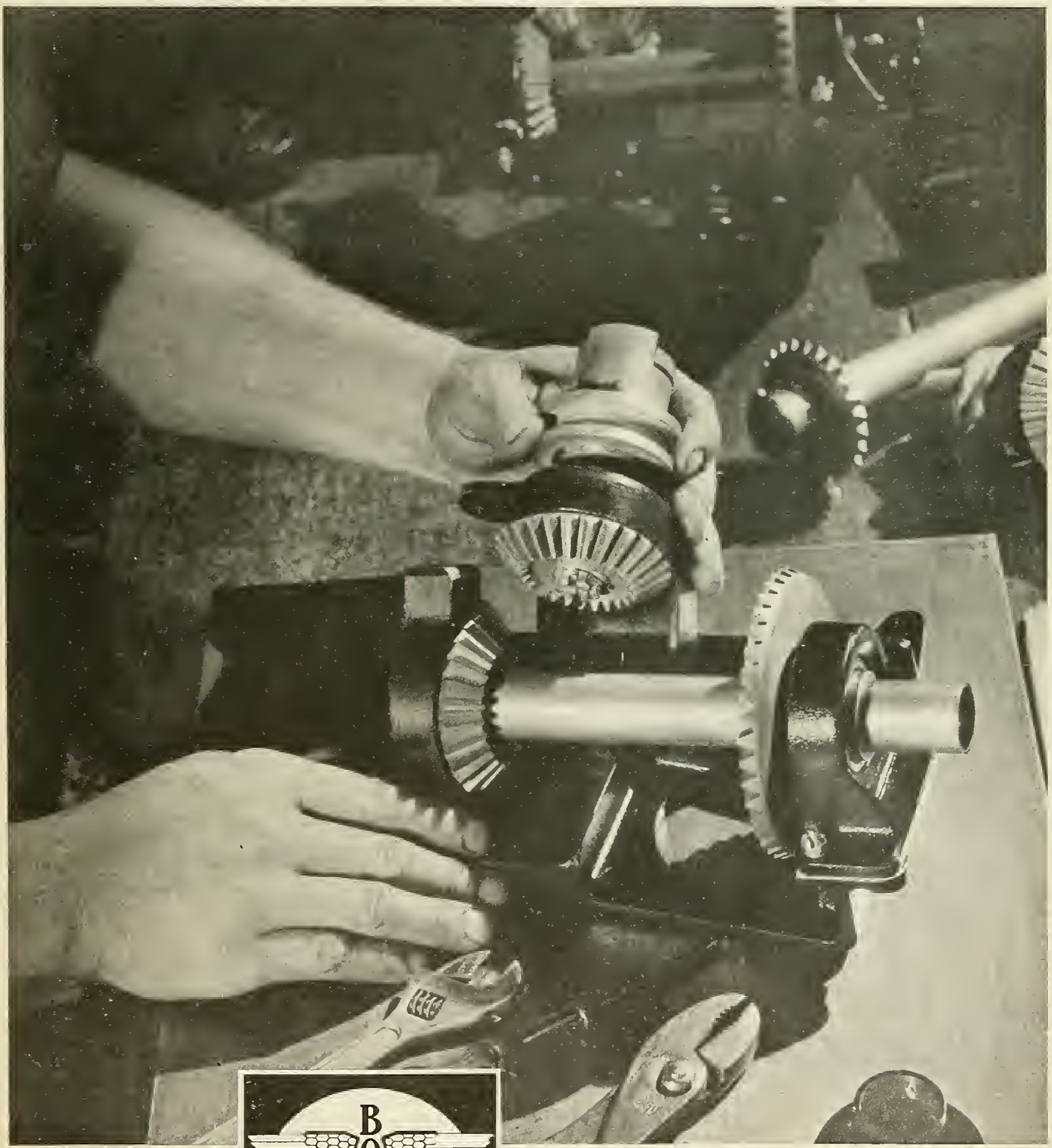
Here are hands which no machinery can replace—hands, rather, which supplement machines in building quality into Boeing planes. Boeing Airplane Company, Seattle, subsidiary of United Aircraft and Transport Corporation.

KNOWING FINGERS



BOEING

BOEING HAS ALWAYS BUILT TOMORROW'S AIRPLANES TODAY!

NRA
WE DO OUR PART

(Continued from preceding page)

New Air Mail Official Named

A RECENT APPOINTMENT by Postmaster General James A. Farley brought Charles P. Graddick the position of Superintendent of the Air Mail Service. Graddick came from the New York Inspection Division, where he served for many years. He is a native of Georgia and for several years was postmaster at Barnesville, a second class office in that state.

New England Line Augments Service

MANCHESTER, N. H., and Burlington, Vt., have been included as stops by Boston-Maine and Central Vermont Airways according to L. F. Whittemore, vice-president, who said flying time from Boston to Manchester has been set at 30 minutes and between Boston and Burlington at 15 minutes. The extension makes a total of 10 cities in Maine. Massachusetts, Vermont and New Hampshire now served by the airline companies which are subsidiaries of the Boston and Maine, the Central Vermont and the Maine Central railroads.

Schedules to the new cities on the line provide for a single round-trip each day during the winter months. Fares have been set at $3.50 one way between Boston and Manchester and $6.00 for the round-trip; between Boston and Burlington the rates are $12 one way and $22 round-trip.

Varney Starts Mexican Service

SAN DIEGO, Calif., is now linked with the Mexican capital city with an air mail and passenger service begun on February 13 by Varney Air Lines, according to L. W. Potts, executive of the new line. Planes fly via Tiajuana, Mexicali, Nogales, Hermasillo, Obregon, Los Mochis, Culican, Tepic, Guadalajara and through the state of Michoacan to Mexico City. The line then continues to San Jeronimo, the company having the mail contract between Tiajuana and that city.

Walter T. Varney heads the new company and is associated with Don Cardiff, Arturo Cubillas, Carlos Ramos and Mr. Potts.

Heavy January Traffic Reported

SHOWING A 70 per cent increase in traffic over the corresponding month of last year, a total of 8,546 passengers traveled over United Air Lines' New York-Chicago-Pacific Coast and other airways in January. This traffic practically equalled the volume for May, 1933, when United transported 8,597 passengers.

During the first month of 1934, planes operated by the company were flown a total of 1,059,436 miles, of which 601,150 miles were recorded on the coast-to-coast route.

TWA DOUGLAS LOWERS COAST-TO-COAST TIME

THE LAST LOAD of air mail carried by Transcontinental & Western Air came from Los Angeles to Newark Airport in 13 hours 4 minutes 20 seconds, a new commercial transport record for a transcontinental trip and a fitting valedictory of the transportation of the mails by private companies. In a new twin-engined Douglas transport, Capt. Eddie Rickenbacker, Jack Frye and others brought in addition to mail, many pounds of express. Actual flying time was 12 hours 29 minutes, time being taken out for three stops. At times, the Douglas was flown at 20,000 feet, averaging about 215 miles an hour for the entire trip.

N. A. A. Group at Mileage Record

COMBINED OPERATIONS of the three air transport lines controlled by North American Aviation, Inc., place the organization second throughout the world by reason of the 12,753,632 revenue miles flown during 1933, a figure which represents an increase of 24 per cent over the preceding year.

Increases in passenger and express traffic handled by Transcontinental & Western Air, Inc., Western Air Express and Eastern Air Transport, the lines in the group, were even larger than the increases in mileage. Revenue passengers totaled 106,361 while express poundage carried totaled 404,811.

United Opens Three New Offices

TRAFFIC REPRESENTATIVES have been assigned by United Air Lines to Detroit, Philadelphia and Minneapolis where special offices have been opened. Detroit and Minneapolis are off-line points, while Philadelphia now has direct service.

M. F. Redfern. long associated with the company's traffic department, is in charge of the Philadelphia office, A. E. Towne has been assigned to the Minneapolis post, and Don Wilson, formerly traffic representative at Cleveland, has taken charge of the Detroit office.

Airline Aids Italian Fliers

WHEN THE initial attempt of Italian pilots to span the South Atlantic with regular air mail service ended in failure and a crack-up on the Brazilian coast recently, it remained for an American pilot and plane to find the stranded and injured fliers and to summon aid.

George L. Rihl, in charge of Brazilian operations for Pan American Airways, on orders from Juan Trippe, president of the company, moved the regular schedules ahead, equipped a Sikorsky S-38 with medicines and food and arranged to patrol 500 miles of the coast from Pernambuco on the south to a point 50 miles north of Fortaleza on the north of Natal in an effort to locate the Italians. The regular passenger and mail plane en route to the United States took off from Fortaleza and about 18 minutes later sighted the wreckage of the plane on the beach at a point 12 miles from the city. Unable to land the plane because of a heavy surf and out-cropping rocks, Bert Sours, the pilot, radioed the Fortaleza base, gave the location of the wreck and described the situation to Burnett Boyd, the airport manager. Boyd, because of the nature of the coastal waters, was unable to reach the site by launch, so he equipped a motor expedition which traveled 60 miles through jungle terrain before they were able to reach the fliers and render whatever aid was necessary.

The Italians had flown across the Atlantic in 13 hours from Dakar, where they had stopped after a fast flight from Rome. The expedition was in charge of Commander Francia Lombardi who was accompanied by Count Franco Mazzotti, Davidi Guilini and Mario Battaglia.

Fire Destroys Airline's Planes

ALTHOUGH ITS equipment and hangar was destroyed by a disastrous fire which swept its operations headquarters at Islip, Long Island, N. Y., Licon Airways, Inc., continued to operate its scheduled New Haven, Bridgeport, Islip, Roosevelt Field and Newark air service. All of the airline's equipment was not at Islip the night of the fire.

Additional equipment to replace that lost in the fire will be purchased and placed in operation at an early date, according to Albert E. Theis, president, who said plans have already been made to construct a new brick and steel hangar at the Islip Airport. Until the new hangar and shops are ready, the airline is headquartering at Roosevelt Field.

STANAVO
AVIATION GASOLINE
AVIATION ENGINE OIL
ROCKER ARM GREASE

COMFORT..

..*in* AIR TRAVEL

WITH the advent of high-speed transports, noise, with its resulting discomfort to passengers, has given Sperry research engineers an opportunity to put their theories for its elimination into practical use. They have already applied acoustical and soundproofing treatment to a number of transport planes, and in the cabin of the new Douglas the noise level has been brought down to that of a Pullman.

A quiet cabin and upholstered chair are inadequate for *complete* comfort. The Sperry Pilot for Automatic Flying has the ability to detect the slightest divergence in flight attitude, and the contrast in stability and comfort when it is in operation is the most convincing evidence of its superiority over hand control. The Sperry Pilot is not used for takeoffs or landings, but once the plane is in the air, the human pilot is relieved of his most arduous task—the effort of holding the plane on its course by constant manipulation of rudder, aileron and elevator controls.

The forty-one Douglas transport planes comprising Transcontinental & Western Air's new fleet will be *Soundproofed by Sperry* and equipped with the Sperry Pilot for Automatic Flying.

SPERRY

SPERRY GYROSCOPE CO., ***Inc.***
BROOKLYN — NEW YORK

PRIVATE FLYING and CLUB NEWS

Active Program Planned in Air

A YEAR replete with flying activity has been planned by the Washington Air Derby Association at its annual meeting held recently at the Racquet Club, Washington, D. C. In an election of officers, Chester H. Warrington was re-elected president.

Other officers are: Dr. H. C. Dickinson and Maj. Gen. James E. Fechet, vice-presidents; C. T. Kettler, secretary; J. Earl Steinhauer, assistant secretary; A. C. Case, treasurer; A. D. Vick, assistant treasurer, and H. A. L. Barker, general counsel. In addition, 24 directors were chosen.

The 1934 aerial program includes a treasure hunt in April, Langley day air meet in May, a fox hunt in June, a week-end cruise in July, a compass hunt in August, an aerial golf game in September, an aerial picnic in October, bomb dropping contests in November and an aviation day in December.

NACA Seeks Tunnel Funds

THE NATIONAL Advisory Committee for Aeronautics held its regular meeting at the Navy Department in Washington at which time plans were discussed for a 500-mile per hour wind tunnel proposed for construction at the laboratories at Langley Field, Va.

The tunnel would be the highest velocity regular wind tunnel in the world, although there is a vertical tunnel now at Langley for testing propeller tip speeds as high as 900 miles an hour.

An application for $478,500 from the Public Works Administrations for the tunnel has been approved in principle, but is being held up for lack of funds, although Secretary Ickes has already received recommendation that immediate action be taken on the project.

Relocated Beam Aids Pilots

THROUGH THE efforts of the Roosevelt Field management and others, the southeastern leg of the Elizabeth, N. J., Department of Commerce radio range beacon is being located so as to pass between Mitchel and Roosevelt fields. This beam previously has gone out to sea off Long Island and has been of no use to the host of fliers in and around Long Island. When the necessary changes are completed at Station WWU in Elizabeth, it will be possible to fly to all parts of the country from Roosevelt Field or to use the beam as a guide back to the field.

MEDICAL EXAMINATION FEES LOWERED

APPLICANTS for pilot licenses will pay $10 for the original and $6 for all renewal examinations, according to a rate revised by the Aeronautics Branch and announced simultaneously with the establishment of a two-year license renewal period. Formerly the private pilot paid $7.50 each year for a physical examination when receiving his license, whereas he now will pay $6 every two years. Transport and limited commercial pilots will pay, under the new procedure, $6 for a renewal examination every six months.

Du Ponts on Air Cruise

WITH RIO DE JANEIRO as their ultimate destination, Alice F. du Pont and her brother, Richard, are now on a leisurely cruise of South American countries in their seaplane. They are flying from Miami in easy stages, heading eastward to Puerto Rico and then southward through the Windward Islands to Rio de Janeiro.

More Chapters for 99ers

FOLLOWING a recent meeting of the north central section of the 99 Club, national organization of women pilots, it was announced that two local chapters have been added to the order. One, under the chairmanship of Gladys Hartung, is in Michigan, while the other is in Chicago with Ruth K. Wakeman in charge.

The south central section held its initial 1934 meeting with an election of officers. Jean La Rene was re-elected governor, Edwyna McConnell, secretary-treasurer; Mary E. Owens, reporter, and Helen R. Johnson and Gerry Honomichl, chairman of various sub-committees.

Mrs. Lindbergh Gets Medal

FOR HER achievements as radio operator, aerial navigator and co-pilot on the 29,000-mile flight with Col. Charles A. Lindbergh, Mrs. Lindbergh has been awarded the Hubbard Gold Medal for outstanding geographic accomplishment by the National Geographic Society. She is the first woman to receive this medal.

According to Dr. Gilbert Grosvenor, president of the society, the honor was conferred for Mrs. Lindbergh's tireless and skillful work during the aerial circumnavigation of the Atlantic by Colonel Lindbergh and her last summer, and for her activities during their flight in 1931 from Washington to Tokyo.

S.A.E. Makes Aviation Awards

TWO ANNUAL awards for engineering work in the advancement of the science of aviation were made at the annual meeting of the Society of Automotive Engineers in Detroit when A. H. Roy Fedden and E. N. Jacobs received recognition for their work in aviation during 1933.

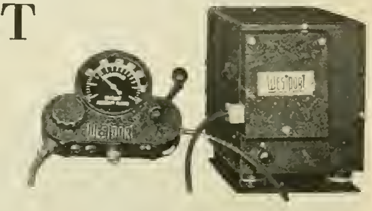
Fedden, of the Bristol Aeroplane Co., Ltd., of England, received the Manly Memorial Medal for his paper describing the "Possible Future Development of Air-Cooled Aero Engines," while Jacobs, of the N. A. C. A., received the Wright Brothers Medal for his paper on the "Aerodynamics of Wing Sections for Aircraft."

Tulsa Air Club Forming

PRIVILEGES ACCORDED Canadian aviation clubs are expected to be available in Tulsa shortly through an aviation club in course of organization by H. N. Royster at the local municipal airport.

Membership is open to all, those joining being promised the use of either a Lockheed, Pitcairn or Ford for instruction, time or pleasure purposes, the cost being pro-rated among all members, and estimated at about $10 an hour. A social element will be included with dances and other social gatherings a part of the general program.

Operating along non-profit lines, it is expected the club will prove a stimulus to aviation in Tulsa.



These PILOTS FLY by WESTPORT

● Ask Jimmy Wedell, Billy Parker or Dr. John D. Brock how they overcome the weather, and they will answer, "I fly by Westport."

● Pilots who know and demand the best use a Westport.

● The names of Westport owners include William Randolph Hearst, Wallace Beery, Hal Roach, Clarence Brown and a long list of aircraft operators that looks like a "Who's Who" of aviation.

● There must be a reason. Investigate.

Westport remote control model AR62T, $245 (above). Other models as low as $99.50.

Pacific Airmotive Corp., Ltd. United Airport, Burbank, Calif.
Oakland Airport, Oakland, Calif.

THE ONLY 4-Passenger Cabin Plane Built to "Airline Transport" Standards

THE NEW STINSON RELIANT FOR 1934 IS AN "AIRLINER" FOR THE BUSINESS MAN AND COMMERCIAL OPERATOR

Stinson Leads—

IN SALES

Outstanding value was responsible for the fact that the 1933 Stinson Reliant outsold ALL MAKES of two, four, and six-passenger cabin planes COMBINED, since its introduction in May. Never before was such decided preference shown for any make of plane.

IN SAFETY

With more Stinson Reliants flying in 1933 than any make of four-passenger cabin plane, not a single person was injured and only one Reliant was damaged, in a landing due to heavy fog. This is a tribute to Reliant Flyers and is definite proof of safety.

IN RELIABILITY

By flying more than 60 million miles on single engine and tri-motored planes in the United States, Alaska, South and Central America, Europe, the Philippines and other countries, the Lycoming Transport engine has been proven *MORE RELIABLE* than any motor of its power class.

The New Stinson Reliant

The new 1934 Stinson Reliant, four-passenger cabin plane, offers many new mechanical features and comforts previously found only in Airline Transport planes, or in planes in the $10,000.00 price class.

The new Reliant provides the utmost in reliable cross-country transportation, with the safety and precision of the modern Airliner, and at operating costs comparable to motor car travel.

The Reliant is the only four-passenger cabin plane built by an organization which also manufactures Tri-motored Transport planes which have proven their reliability in 20,000,000 miles of scheduled Airline service.

Only in the Reliant do you obtain the Lycoming 225 H. P. Transport Motor, whose reliability has been amply proven by 60,000,000 miles of flight in Airline and private service. No other motor of this horse power has ever flown so far. Because safety in an airplane depends particularly on the reliability of the motor, you will be wise to demand that the motor which powers your plane be proven by "Several million miles of regularly scheduled Airline Service."

STINSON Aircraft Corp.
Wayne, Mich., U. S. A.
Division of Cord Corporation

WRITE FOR YOUR COPY OF STINSON PLANE NEWS, MAILED FREE POSTPAID

NEWS OF THE SCHOOLS

Ground School Approved

THE WISCONSIN School of Aviation, organized in Milwaukee last fall by Carl J. Zimmerman, president, has been granted an approval by the Aeronautics Branch of the Department of Commerce to operate a ground school in the amateur, private and limited commercial categories.

At present the school has an enrollment of 75 students.

Dallas School Busy

IDEAL FLYING conditions of the Texas winter for training courses has attracted students from more than 20 states and two foreign countries to the Dallas School of Aviation, according to C. E. Harman, general manager. Among the students registered are some from Cuba, Guatemala and Canada.

Airline Host to Students

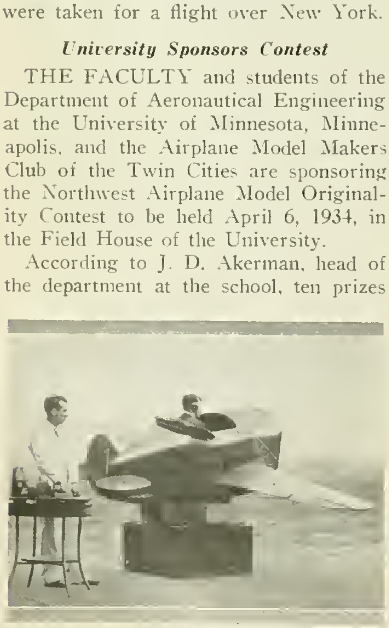
CONTINUING IN its effort to bring before the public the safety of aviation and air transportation, *Sky Scandal*, official organ of the Haaren High School aviation annex, New York, N. Y., arranged for a group inspection of the Newark Airport and its facilities by editors of high school publications.

With the cooperation of Eastern Air Transport, the party was taken to the field in buses where a detailed inspection was made of the company's equipment and facilities. Maintenance of transports and radio communication apparatus were some of the activities seen by the editors during the tour of inspection. They also were taken for a flight over New York.

University Sponsors Contest

THE FACULTY and students of the Department of Aeronautical Engineering at the University of Minnesota, Minneapolis, and the Airplane Model Makers Club of the Twin Cities are sponsoring the Northwest Airplane Model Originality Contest to be held April 6, 1934, in the Field House of the University.

According to J. D. Akerman, head of the department at the school, ten prizes will be awarded in the flying and non-flying group for models displaying the most originality in design or construction.



Blind flying trainer used by Casey Jones School of Aeronautics

SCHOOLS REPORT INCREASED STUDENT ENROLLMENT

AS THE Spring training season approaches, evidences of increased interest in flying are seen in the reports of banner enrollments in many schools. Ryan School of Aeronautics has taken on 11 new students, while the Curtiss-Wright Mechanics School at Baltimore reports that it is training 25 flight and a number of mechanic students.

Montgomery School Opens New Unit

THE MONTGOMERY School of Aeronautics, Montgomery, Ala., has just added a new parts service branch to its ground and flying school, repair and maintenance business at the Montgomery Airport. An aviation supply catalog issued by the school lists items needed to repair or overhaul aircraft and, according to L. G. Mason, president, the company carries a complete stock for repair work.

Training at the school is under the direction of Flight Instructor L. L. Brabham and Fairchild 22's are used for instruction. Other officials are T. D. McGough, Jr., and C. K. Weil, vice-presidents and J. L. Goodwyn, secretary.

New Operators for Watson School

THE ENTIRE operations of the Watson Airport, Cincinnati, Ohio, have been taken over by EMS Flying Service, formed by Elmer and Melville Schmidt.

In addition to the flying school, they are offering charter work, storage and service and repair facilities.

Aviation Courses Revised

SEVERAL ADDITIONS have been made in the engineering and master mechanics courses given by the Aeronautical University, Chicago, Ill., to more thoroughly equip its students to meet every possible requirement for employment after graduation.

According to Director Louis M. Churbuck, the engineering course has been extended to 18 months with a problem of the design of a complete airplane, including complete stress analysis, given as the concluding problem. A substantial prize is to be awarded for the most satisfactory design submitted.

Radio has been added to the master mechanic's curriculum allowing students the opportunity of taking the radio telephone operating training so essential in major airline requirements for employment at the present time.

Casey Jones Offers New Courses

A LOW-TUITION radio beam and instrument flying course is now being offered by the Casey Jones School of Aeronautics, Newark, N. J., in which instruction is given on the ground in a small trainer, equipped with regular controls, radio, a hood, complete instruments and actuated by an electric motor and compressed air.

The student is given five hours instruction in instrument flying under the hood, then he takes up beam flying, orientation and location of station and after 15 hours on the trainer, is taken into the air under a hood and the same tests repeated. Experiments conducted with a group of students indicate that after about five hours in the air the average student is able to fly entirely by instruments, to orientate himself and to follow the beam.

The course is the first flying training given at the school, as heretofore activities have been confined to instruction in mechanics and engineering. Enrollment at the school has reached 175 students.

N. Y. U. Trains Ground Teachers

COURSES IN aviation for pilots and ground-school instructors outlined to train a person to teach in a transport pilots' ground school or in a public school, are being given in the School of Education, New York University, New York, N. Y., under the direction of Professor Roland H. Spaulding.

Designed for completion in two semesters, the courses include instruction in airplanes, engines, instruments, air commerce regulations, meteorology, navigation, radio and parachutes. Other courses taught are recent developments in aviation and their effect on education, research in aeronautical education and contemporary trends in commercial aviation. Many executives obtained to speak on specialized topics during one of the courses include Giuseppi Bellanca, J. S. Allard, Leighton Rogers, Sherman Fairchild and Major E. E. Aldrin.

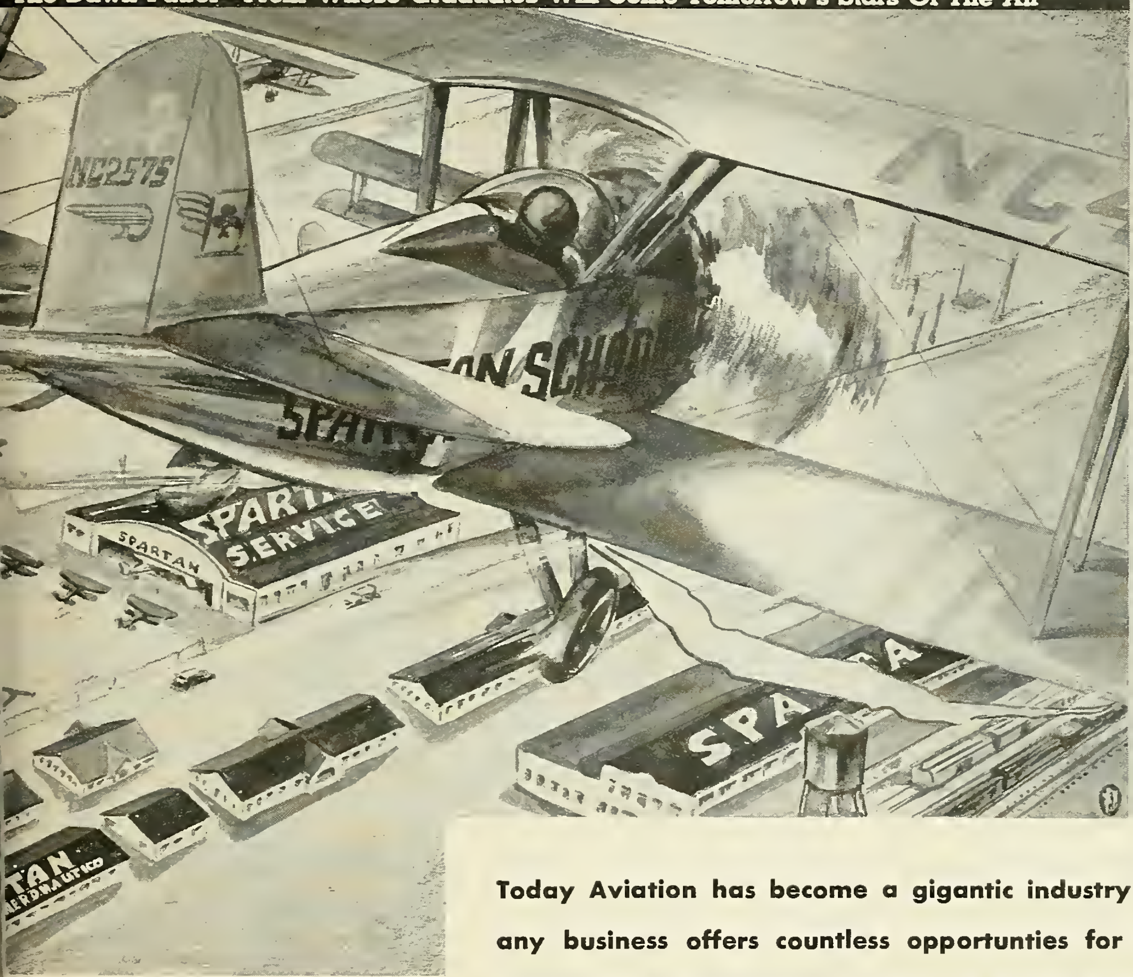
Ryan Adds Radio Course

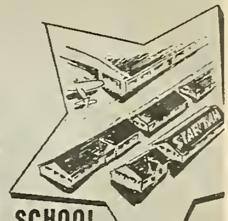
THE NEW radio course added to the curriculum of the Ryan School of Aeronautics, San Diego, Calif., will be under the direction of Lieut. Myron F. Eddy, U. S. N. (Ret.), author of several text and technical books and an authority on the subject.

Two classes have been started; one covering five weeks of lectures in preparation for an aeronautical radio license and the other covering ten weeks of code practice in preparation for the commercial radio license.

SPARTAN 3 *star* FLYING COURSES

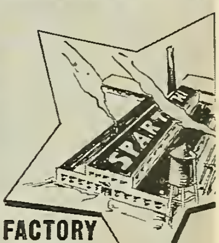
The Dawn Patrol—From Whose Graduates Will Come Tomorrow's Stars Of The Air





SCHOOL

Spartan, the only MILLION DOLLAR Flying School in the World Gov ment Approved, offering comp courses in all branches of Aeronau



FACTORY

Students of Spartan as part of their regular courses get practical training in Spartan Aircraft Factory—one of country's most modernly equipp

SHOP

Further practical instruction on types of ships is given the stud in the Spartan Government proved Repair Station No. 50— of the highest rated in the Southw

Today Aviation has become a gigantic industry that like any business offers countless opportunties for the men trained for it s leadership. Spartan is giving such training in the 3 STAR ☆ ☆ ☆ Flying Courses that combine Theory, Study, and Actual Operations, made possible by the Spartan organization that comprises ☆School, ☆Factory, and ☆Shop —THE ONLY MILLION DOLLAR COMMERCIAL FLYING SCHOOL IN THE WORLD GOVERNMENT APPROVED—Can you accept less than Spartan Training? Write today for details of this great forward step in Aviation Training.

COMPARE THESE PRICES

Room Rent FREE with any course during entire period of training. Part time work if desired.

Transport Pilot's Flight and Ground Course	$1,745.00
Limited Commercial Pilot's Flight and Ground Course (Includes Master Mechanic's Ground Course)	520.00
Private Pilot's Flight and Ground Course (Includes Regular Mechanic's Ground Course)	375.00
Master Mechanic's Flight Course (15 Hours Flying)	300.00
Master Mechanic's Ground Course (5 Months)	225.00
Amateur Pilot's Flight and Ground Course (Includes Regular Mechanic's Ground Course)	285.00
Regular Mechanic's Flight Course (15 Hours Flying)	225.00
Regular Mechanic's Ground Course (3 Months)	135.00

The ECONOMICAL Schooli

Spartan
SCHOOL OF AERONAUTICS

O. BOX 2649 MUNICIPAL AIRPORT, TULSA, OKLAHOMA

Spartan Students Tomorrow Aviation's Brightest STARS

AT THE AIRPORTS

Salt Lake Traffic Increases

WITH PASSENGER traffic showing a 63 per cent increase over 1932 and with a bright outlook for 1934, the Salt Lake City Municipal Airport is visioning a most successful year, according to Vern G. Halliday, airport manager.

Maintaining its position as one of the largest air mail centers in the country, the port is fast developing importance as a passenger station. During 1933, 35,000 passengers were handled, or an average of 91 daily. There were 9,250 scheduled arrivals and departures of planes.

Three airline companies are now operating regularly from the field with passengers and air express. They are United Air Lines, Western Air Express and National Parks Airways.

The opening of a new administration building has provided facilities at the field which were heretofore lacking, but commercial activities were somewhat reduced in comparison with previous years. Thompson Air Service, Inc., which is equipped to care for transient planes, student activities, charter work and rebuilding of planes and engines, conducts this phase of the work on the airport.

Westchester Tract Favored

ESTABLISHMENT OF an emergency landing field on a tract near Greenburgh, N. Y., has been favored by the Westchester County Park Commission and the matter referred to the County Attorney to work out a plan of procedure.

Opposition to the project has come from a number of residents on the grounds that it constituted a nuisance and a detriment to property values. However, Eddie Rickenbacker and Frank Hawks, both Westchester residents, said the project was needed because no emergency landing field was available in that part of the county. It is understood that the Park Commission has been offered $110,000 of Federal funds to construct two runways, one 1,800 feet and the other 2,000 feet.

Lincoln Improvements Started

WORK OF improving the municipal airport at Lincoln, Neb., is now under way. It includes resurfacing of runways, construction of a landing circle, installation of four runway flood lights and graveling around buildings. Other work entails discing and harrowing the surface of the field, filling in and seeding the west side of the field and furnishing the new administration building and depot.

Isolated City Seeks Port

AN AIRPORT is being planned for Boulder, isolated and almost inaccessible cattle town in southern Utah. The town, situated on a high plateau surrounded by cliffs, can only be entered over a pack trail, but after Sherman Falkenrath flew into it recently in a few hours from Salt Lake City the prospects of air service took on a brighter aspect. At present, it takes more than a day to travel between the two cities.

688 AIRPORT PROJECTS UNDER WAY IN U. S.

THE CWA Airport program under way includes 385 new fields and 303 improvements to existing facilities, according to a most recent survey of the Aeronautics Branch. Forty-five states have taken advantage of the funds made available, with Minnesota leading in the number of projects under way with a total of 68. Florida is second with 54 and Montana third with 52. The number reported here is 125 more than was reported last month when 563 such projects were being built.

Roosevelt Field Adds to Museum

ONE OF THE most interesting and best known of the war-time airplanes procured to date by Roosevelt Field Aviation Historical Museum is an old single seater, French Spad 13, a type used by many of the Allies during the latter days of the war. This plane was procured for exhibit from Lieut. Benjamin Kelsey of the Army Air Corps who purchased it several years ago and stored it away.

The plane is now at the School hangar where it is being restored to its original appearance.

Aero Trades Active

INCREASED BUSINESS at the Aero Trades, Inc., hangar, Roosevelt Field, Mineola, Long Island, N. Y., has necessitated the addition of more employees who are now engaged in overhauling and reconditioning several jobs, including the Curtiss Hawk owned by Al Williams. A Wright Cyclone engine is being installed in this ship to replace the Jupiter engine previously used.

James G. MacIntosh, Aero Trades executive, was commissioned to supervise the transportation and installation of Col. Lindbergh's Lockheed in the American Museum of Natural History.

Waco Appoints New Distributor

PARKS AIR COLLEGE, E. St. Louis, Ill., has been appointed distributor for the complete line of Waco aircraft and is planning an aggressive sales campaign and the establishment of dealers in the territory assigned. At the same time, the school also took on the distributorship of Universal propellers for the territory of Indiana, Arkansas, Southern Illinois and Eastern Missouri.

The Waco line includes four models, while the wood Universal propellers are made for practically every modern aircraft engine.

$12 Million Sought for Fields

NEW AIRPORTS for Petaluma, Santa Rosa, Ukiah and Eureka, Calif., with additional links in the chain along the north coast into Oregon and Washington are envisioned in an extensive plan of airport development for which a special fund of 12 million dollars will be asked from the Federal Government. CWA Airport Representative W. L. Shields recently conferred on the plan with Mayor J. R. Thomas of Ukiah and is proceeding to other sections of the projected route to confer with civic authorities there. It is expected that funds may be made available in the very near future.

Four Emergency Fields Planned

FOLLOWING SELECTION of three new emergency field sites for the state of Washington, a fourth field on the Western Washington side of the Seattle-Wenatchee air route has been proposed to the Department of Commerce by County Engineer Thomas D. Hunt. The field would be at Hot Springs in southeastern King County and like the others proposed, would measure 400 by 2,500 feet.

Alabama Drives for Ports

PRELIMINARY INSTRUCTIONS have been sent to 85 towns and cities in the state of Alabama as to how they may obtain airports through funds provided by the federal government, according to Sumpter Smith, state advisor.

Several ships flew throughout the state to promote the plan for building the fields. Town officials, notified in advance of their arrival, were instructed to look for messages the pilots would drop.

Five engineers and pilots have been appointed to make Alabama surveys and assist in construction work. They are: A. J. Hawkins, E. W. Stanford, L. G. Mason, S. F. Tatum and W. T. Brownell.

Ailor Sells Five Wacos

AN ORDER from the Department of Commerce for five new cabin Wacos has been received by Waco Sales of New York, according to Howard Ailor, president. A number of used planes were taken in trade.

Ailor spent a few days at the Palm Beach, Fla., branch of his company where he demonstrated a new cabin Waco to a number of prospective purchasers.

Bryan to Get Municipal Field

A MUNICIPAL airport will be constructed at Bryan, Tex., following lease of a site and approval of material by a representative of the Department of Commerce. Three runways are planned, ranging in size from 3,000 to 3,500 feet, constructed of gravel and rolled with oil.

• THE AIR SERVICES •

Bills Call For More Service Craft

PROSPECTS FOR equipping the Army and Navy air forces with about 3,000 new airplanes in the next five years are decidedly encouraging following the passage of the Vinson Naval bill in the House of Representatives and the approval by the General Staff of the McSwain proposal for army aircraft.

Passed by an overwhelming majority in the House, the Vinson bill provides for a naval construction program which will cost the government $475,000,000 for 102 war vessels and 1,184 planes to increase the Navy to full London naval strength. The McSwain bill, already offered in the House, but not yet acted upon, provides for gradual acquisition of new airplanes over a five-year period. It does not specify a definite number of new aircraft, but gives the Secretary of War authority to acquire sufficient equipment to permit establishing an organization to be known as the GHQ Air Force. However, a provision to maintain not to exceed 2,000 serviceable aircraft during the next five years, indicates an intention to procure at least 1,000 new ships as early as possible. Upon acquisition of these new planes, an increased personnel of about 400 officers and 2,600 enlisted men is authorized.

Lighter-than-air Class Convenes

A GROUP of 30 enlisted men of various ratings in the Navy have been assembled at the Naval Air Station, Lakehurst, N. J., for training in lighter-than-air craft. Another class will be convened on July 5, 1934, for similar training.

Classes at the station are under the direction of Lieut. Comdr. Jesse L. Kenworthy, commanding officer at Lakehurst. Lieut. Comdr. T. G. W. Settle prepared the course curricula and is in charge of the lighter-than-air craft school. The non-rigid airship K-1 and the metalclad ZM-C2 are now at Lakehurst.

Guard Macon Against Collision

MOVEMENTS OF the U. S. S. *Macon* along or near the Federal Airways System are to be broadcast by Department of Commerce airway radio stations to other aircraft in flight as a precaution against the possibility of collision, especially at night and during conditions of limited visibility, according to an arrangement worked out by the Department of Commerce and Navy officials.

Twice every hour, following regular weather broadcasts, the position of the dirigible on local flights will be given by the station at Oakland, Calif. On flights beyond the San Francisco Bay region, the stations along the airways along which it will fly will cover the *Macon* and broadcast its movements as it comes into their sectors.

ADD TWO YEARS TO ARMY'S FLYING COURSE

INSTEAD OF BEING commissioned immediately upon graduation, flying cadets from Kelly Field will be sent to duty with tactical units for one year as cadets and one year as reserve officers. Action by the Chief of the Air Corps was taken, it is understood, as an economy measure and to keep down loss of equipment.

McGinnis Shifted to Navy Bureau

LIEUT. COMDR. Kneffler McGinnis, commander of the naval squadron VP-10F which broke the non-stop formation flight record with a hop to Hawaii in January of this year, will be transferred to the Bureau of Aeronautics, Washington, D. C., in April. Commander McGinnis has been in charge of the squadron since April 1931, and from 1921 to 1924 served with the Bureau of Aeronautics.

Cheney Award Bestowed on Three

A SECOND Lieutenant of the Army Air Corps Reserve and two enlisted men are to receive the Cheney Award for valor and self-sacrifice connected with aviation, marking the first time since the foundation was created that more than two men were named during the same year.

Lieut. W. L. Bogan, Staff Sergt. D. D. Dodd and Sergt. T. J. Rogers are being singularly honored for their heroism in saving two enlisted men from a burning ship which was involved in a crash-landing at Fort Clark, Calif.

Grumman Fighter Delivered

FOLLOWING A series of tests on the experimental flight-deck landing platform built on the Naval Air Station field at Norfolk, Va., in which it showed merit in take-off, landing speed and rate of climb, the new Grumman fighter has been sent to the west coast for operation on the *Lexington* and *Saratoga.*

The Grumman company, which operates from Farmingdale, L. I., N. Y., now has two types in service, the other being an observation ship.

Navy Seeks Flying Fields

NEGOTIATIONS ARE being undertaken with a view to leasing outlying fields for the use of fleet aircraft next summer, with the Norfolk Airport, the Tidewater Airport, Rainey Field and the Whitehurst Farm being considered. Of these the Rainey Field is the only one which previously has been used by the Navy at the Naval Air Station in Norfolk, Va.

The Whitehurst Farm would make an irregular shaped field, 2,200 by 3,700 feet. In addition, the northwest flying field on the Naval Operating Base is also being reconditioned for fleet use to give an area 1750 by 1830 feet adjacent to the carrier pier.

Reserves Elect Officers

THE AIR Reserve Officers Association of the Second Corps Area held an election of officers in New York City at which time Maj. John M. Hayward was chosen president. Other officers elected were Capt. John F. McNeill, first vice-president; Maj. Paul C. Durbin, second vice-president; Capt. James G. Fernald, treasurer and Lieut. C. Alberi, secretary. The executive committee consists of Lt. Col. J. H. Lapham, Lt. Col. S. Willard Rich, Maj. Malcolme G. Spooner, Capt. Edward L. Smith and Capt. Charles C. Greene.

The area has been divided into three units, each of which goes on active duty every third week and engages in all tactical maneuvers. These units and their commanders are the 302 Observation Squadron, Col. Lapham; 369 Observation Squadron, Maj. Hayward and the 861 Observation Squadron, Maj. Durbin.

Macon Plane Aviator Commended

UPON THE occasion of his transfer to the new heavy cruiser U. S. S. *Minneapolis,* now being completed at the Philadelphia Navy Yard, Lieut. D. W. Harrigan, who for the past three years served as senior naval aviator of the heavier-than-air craft units of the airships *Akron* and *Macon,* was commended by the Secretary of the Navy for his successful operations during his tenure of service with the lighter-than-air craft units.

New Class at Randolph Field

PRIMARY INSTRUCTION was begun March 1 by a new class of flying cadets at Randolph Field, Texas. Comprising 145 students, the class is scheduled to undergo eight months of training before advancing to Kelly Field.

The Army Air Corps sent 34 enlisted men to the school, three came from other branches of military service while 108 are from civil life.

THE INDUSTRY IN GENERAL

New Air Advisory Group Chosen

INTER-DEPARTMENTAL study for the purpose of establishing a uniform federal aviation policy will be undertaken by the Inter-Departmental Advisory Committee on Aviation, formed following President Roosevelt's approval of a plan presented by Secretary Roper.

The committee will undertake a comprehensive program in the interest of definite policies for aviation along necessary lines and will attempt a study to ascertain to what extent coordination may be effected and greater coordinating efficiency attained in promoting and fostering aviation for military, commercial and non-commercial private flying.

Secretary Roper is chairman of the committee, Dr. W. M. W. Splawn of the Interstate Commerce Commission is vice-chairman and Col. J. Carroll Cone of the Department of Commerce is secretary. One voting representative from the Army, Navy, the Department of Commerce, Post Office Department and Interstate Commerce Commission will be on the committee.

Among the problems which might be studied in the immediate future are the development of private ownership in use of aircraft and the use of the commercial pilot and plane as part of the national defense program; a subvention policy and plan for air mail contracts, airways, equipment development and experimental work; coordination of research, development and experimental work of the various government agencies; the air transport system; the development of airports for private and miscellaneous flying; the consideration of trans-Atlantic and international airways and services and new uses of aviation services in other government agencies.

New Light Plane Produced

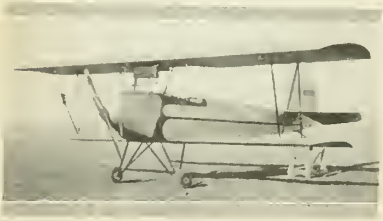
A NEW low-priced airplane, powered by a four-cylinder Model A Ford motor, has been successfully test flown in Wichita by the Straughan Airplane Co.

The result of a number of years of experimentation, the plane features a low selling-price of $990, a top speed of 80 miles an hour and a quick take-off of six seconds. It is a two-place side-by-side open biplane, equipped with dual controls.

The plane has a useful load of 471 pounds and a gross weight of 998 pounds. It carries 7 gallons of gasoline, enough for two hours of cruising.

Wings are of conventional wood and fabric construction with internal and external bracing, while the fuselage and tail surfaces are of chrome-molybdenum steel tubing with fabric covering.

Officials of the new company are Frank Straughan, R. C. Holmes and E. B. Hiatt.



New Straughan plane with Ford engine

C-W TO BUILD FACTORY IN CHINA FOR PLANES

A FIVE MILLION dollar airplane factory will be built in China by the Curtiss-Wright Corp., according to T. P. Wright, vice-president of the Curtiss Aeroplane & Motor Corp., Buffalo, who said that recent sales of Curtiss planes have resulted in such favorable reaction by the Chinese Government that it agreed to assist in the financing of a manufacturing plant in the Orient and in the disposal of the output. At first, parts and materials will be shipped from this country, but later only motors will be imported by the Chinese.

Bellanca Skyrocket for Bendix

A BELLANCA Skyrocket, formerly used by the Eclipse Aviation Corp., East Orange, has been transferred to the headquarters of the parent company, Bendix Aviation Corp., at South Bend, Ind., where it will be used in a series of tests on products manufactured there.

Much of the testing of Bendix products will continue to be made at the Army experimental station at Wright Field, but continuous work tests will be undertaken at the new airport near the Bendix factory. Homer Stockert, president of the Stockert Flying Service, will be in charge of the test plane.

Radio Approach System Developing

TO ASSIST airmen to find their way through clouds or fog to an airport and maneuver their craft to a landing under ceilings as low as 50 feet, the Air Navigation Division of the Department of Commerce is working on the development of a radio approach system.

Not as comprehensive an aid to landing under adverse conditions as the Commerce Department's radio system for blind landing of aircraft, the radio approach system is simpler and requires very little special equipment.

On the aircraft the regular radio receiving set used for reception of weather broadcasts and radio range beacon signals is all that is required. On the ground the equipment consists of a radio range beacon and two marker beacons.

Northrop Acquires Bus Plant

ACCELERATED ACTIVITY in the airplane manufacturing industry is indicated in the announcement of the purchase of the Pickwick Motor Coach plant at El Segundo, Calif., by the Northrop Corporation, subsidiary of Douglas Aircraft Corp., at a purchase price said to be in excess of $30,000.

The plant is situated immediately adjacent to the Northrop plant, and formerly housed an assembly line for motor coaches. Present plans call for the immediate utilization of the added floor space for equipment for constructing new type planes.

Radio May Operate Teletype

ORGANIZATION of a committee of radio experts to study the practicability of utilizing radio for the operation of the nation-wide network of Department of Commerce aeronautical teletypewriter circuits was announced by Rex Martin, Assistant Director of Aeronautics in charge of Air Navigation.

Mr. Martin will serve on the committee with Paul Goldsboro, president, Aeronautical Radio, Inc.; W. H. G. Finch, secretary and chief engineer, American Radio News; Eugene Sibley, chief communications section, and W. E. Jackson, chief of the radio section, Aeronautics Branch.

If the radio can be applied to the operation of the teletypewriter machines on the airways, the Department's airway radio stations and radio operators would assume the radio phases of teletypewriter operation and thus eliminate the leased land-wires.

In an experimental installation, the committee will send both the hourly weather reports and the weather maps over the circuit affording an excellent comparison between the two methods.

Stratosphere Weather Studied

WEATHER CONDITIONS in the stratosphere are to be studied by means of sounding balloons carrying delicate recording instruments and supplemented by high altitude observations by plane according to Professor C. G. Rossby, director of the Massachusetts Institute of Technology's meteorological laboratory who is superintending the study at Lambert Field, St. Louis, Mo.

The plane will be in charge of Lieut. H. B. Harris, research pilot of the Institute, who is expected to make several flights daily to an altitude of about 17,000 feet during the study.

Information gathered in these upper air observations is expected to contribute to knowledge of meteorological conditions in the stratosphere and to advance studies of weather forecasting.

50 Fleet Trainers to Be Exported

CONTRACTS WITH two foreign countries for a fleet of 50 trainer planes costing about $200,000, have been obtained by the Consolidated Aircraft Co., Buffalo, New York. China will take 30 planes for delivery in May, June and July, while the other order for 20 planes is going to Roumania.

Both countries will use these ships to train Air Corps cadets, and ten of the Chinese planes will be sent to the Hanchow government air school.

According to Lawrence D. Bell, vice-president of the Consolidated company, China has purchased 72 planes from his company in the past two years.

Ease Renewal Requirements

THE AERONAUTICS Branch, Department of Commerce, is keeping up its intention of making simpler adherence to the Air Commerce Regulations by pilots and other licensed personnel of the aviation industry. A new policy, recently worked out by Col. J. Carroll Cone, Assistant Director of Aeronautics in charge of air regulation, requires pilots and amateur pilots to undergo a physical examination for renewal only every two years instead of annually and allows them and mechanics, parachute riggers and ground instructors the opportunity of mailing their applications directly to the Department instead of presenting them personally to field inspectors as in the past.

Private pilots seeking renewals until December 7, 1934, however, will be required to submit evidence of physical examinations as heretofore. The two-year provision became effective for amateur pilots on December 7, 1933, the date on which changes in the regulations created this license.

Two Kinners Sold

AMONG RECENT sales announced by the Kinner Airplane & Motor Corp., Ltd., of Glendale, Calif., was the purchase of a *Sportwing* by Joseph W. Harper of Mines Field, Inglewood and a *Sportster* by George Leonard, Municipal Airport, Long Beach, Calif.

Drive on Fog Under Way

A PLAN of action against the fog menace was undertaken by prominent physicists and aeronautical experts at the Aeronautics Branch of the Department of Commerce when a conference, called by Rex Martin, Assistant Director of Aeronautics in charge of air navigation, convened.

Although the Department's experiments attacking the problem by means of radio have been partially successful in that landings have been made by the use of the curved radio landing beam, Mr. Martin feels that a complete solution to the problem will be found if it is possible to transmit light waves through fog, either in the visible or invisible spectrum, and have these waves translated into those which will normally register on the retina of the eye in a manner similar to looking at a light. It is his idea that since mechanical devices are subject to failure, the conference should attack the problem from the angle of developing a light source which would enable landings by sight.

(*Continued on following page*)

• Digest of Recent Events •

Frenchmen Again Cross Ocean

AN EXPERIMENTAL flight in the interest of the French Air Postal Service came to an end at St. Louis, Senegal, Africa, when the *Southern Cross* completed a return transatlantic flight from Natal in 21 hours 31 minutes. The flight the other way took 18 hours 17 minutes, but no effort was made to maintain excessive speeds. The *Southern Cross* is a flying boat and was piloted by Commander Germain Bonnot and a crew of three. JAN. 31.

Flier Claims Speed Mark

A WORLD speed record for an international flight was claimed by Paul Mantz, Los Angeles pilot, following his return from Balboa, Panama, bringing a passenger to Palm Springs, Calif. Mantz said he flew the 3,600 miles from Los Angeles to Balboa in 21 hours 40 minutes actual flying time, making only two stops and averaging 166 miles an hour. FEB. 1.

Stratosphere Fliers Reach Record Height

BEFORE the three Russian balloonists, Pavil Fedoseinko, Andrey Vasenko and Ilya Usyskin, were killed in the crash of their steel gondola they reached a height of 72,178 feet, a new unofficial world's record fully authenticated by records and instruments found in the remains of the wreckage. While no witnesses to the tragedy could be found, it is believed the gondola tore loose from the envelope while still in the air as a result of excessive progressive acceleration in descent. FEB. 2.

Brazil-Berlin Flight Made in 3 Days

A FAST mail plane from Brazil landed in Berlin after flying the distance of 5,700 miles in 3 days 8 hours and 40 minutes. Stops were made in mid-ocean at the *Westfalen*, at Bathurst and Seville, Spain. FEB. 12.

Two New Speed Marks Set at New Orleans

BEFORE THE Pan American Air Races at Shushan Airport, New Orleans, La., ended, speed marks in two categories were set by the competing pilots. Jimmie Wedell set a new record for land planes at 100 kilometers by flying one of his own planes at 266 miles an hour. The other record was set by S. J. Wittman, who flew a special racer weighing less than 400 pounds over the 100 kilometer course at 137.5 miles an hour. The previous mark was held by Clarence C. Presp, who flew 101.24 miles an hour in 1930. FEB. 14-17.

Ulm Flies Solo Across Tasman Sea

THE SECOND solo crossing of the Tasman Sea between Australia and New Zealand, a stretch of more than 1,000 miles, was made in 11 hours by Charles T. P. Ulm in his plane, *Faith in Australia*. The only previous solo flight was made in 1931 by the Australian, Guy Menzies. Ulm, however, had flown across the sea once before, but on that occasion was accompanied by Sir Charles Kingsford-Smith in the pioneer flight of 1928. FEB. 17.

Cierva Receives Aviators Trophy

THE INTERNATIONAL Federation of Aviators presented their trophy to Juan de la Cierva, inventor of the autogiro, for the most outstanding aeronautical achievement in 1933. The Spanish president, Alcala Zamora, making the presentation, praised the last year's work of the inventor in the development of the autogiro. Cierva's latest autogiro development is a wingless type which has been successfully flown. FEB. 10.

Douglas Lowers Scheduled Coast-to-Coast Time

NEW YORK and Los Angeles are now only 13 hours apart by regular airline service as a result of the transcontinental flight made by Capt. E. V. Rickenbacker and a party of observers in a new Douglas twin-engined airliner. The Douglas landed at Newark Airport 13 hours 4 minutes after leaving Glendale, Calif., making only three stops enroute and at times attaining an altitude of 20,000 feet. In order to set the new record which is almost 5 hours faster than the old, the Douglas averaged 215 miles an hour. FEB. 19.

• Coming Events •

Competition for design of dirigible airshed ends. Institute for Scientific Research of Experimental Airship Construction and Operation. Dirigeablestroy, Moscow, Russia. MAR. 1.

Entries for Wm. E. Boeing Scholarships close. Boeing School of Aeronautics, Oakland, Calif. APRIL 1.

International Show of Sport and Touring Aviation under auspices of Aero Club of Switzerland. Palais des Expositions, Geneva. APRIL 27-MAY 6.

Deutsch de la Meurthe Cup Competition. MAY 2.

Stratosphere flight under auspices of Army Air Corps and National Geographic Society by Major William Kepner and Captain Albert W. Stevens. Tentative date of take-off JUNE, 1934.

Grand Prix of the Aero Club of France. Speed races between Deauville and Cannes and return for cash prizes and Armand Esders Trophy Cup. JULY 21-23.

Third Air Tour Around Italy. AUG. 1-15.

International Touring Challenge of the Polish Aero Club. AUG. 28-SEPT. 16.

Gordon Bennett Balloon Race. Auspices of Polish Club, Poland. SEPT. 23.

MacRobertson Race, London-Australia. Speed race and handicap race. Under regulations of Federation Aeronautique International and competition rules of Royal Aero Club, 119, Piccadilly, London, W.I. Entries close June 1. OCT. 20.

(Continued from preceding page)

Radio Static Said to Be Eliminated

THE TROUBLESOME static is understood to have been eliminated by the use of anti-static headphones for the pilots and ground station operators of Transcontinental & Western Air, Inc., following a development in the company's radio department.

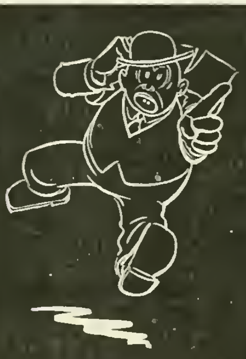
The new type headphones are equipped with a special diaphragm whose oscillations are limited or dampened with the result that even the heavy bursts of static sometimes heard during a thunderstorm are quieted to a noticeable degree. The voice and code radio signals are easily distinguished above the static. It is felt that this development will result shortly in the adoption of the principle in all radios.

Wright in Soviet Engine Deal

AIRPLANE ENGINE contracts involving $2,500,000 are in process of negotiation between the Soviet Government and the Wright Aeronautical Corporation, according to Guy W. Vaughan, president of the company.

Vaughan said his company is negotiating two contracts, one for $400,000 and the other approximately $2,000,000. The Soviet Government, he said, has already placed contracts for $400,000 with the Wright company this year, and approximately half of the engines involved have been shipped.

The Wright company recently completed arrangements whereby the Soviet Government obtained the license to manufacture Wright Cyclone and Whirlwind engines.



"I Have you written for the advance dope on the new Luscombe metal plane which will change all standards for airplane comparisons?

LUSCOMBE AIRCRAFT CO.
KANSAS CITY, MO.

Wind Clock Developed

AN INSTRUMENT that can tell the direction and velocity of wind at a glance is the latest aid to airway weather reporting developed by the engineering department of United Air Lines to facilitate reporting of ground winds at airports to incoming planes.

The instrument resembles the face of a clock, with compass points instead of hour numerals, and with tiny electric light bulbs at each point. A weather vane switches on the bulb at the particular compass point coinciding with the direction of the wind. In addition, a graduated tube of liquid attached to the device records the exact velocity of the wind.

Devices of this type are being installed in all radio telephone stations of the company along its entire coast-to-coast system.

Eaton Valves for Foreign Engines

SUB-LICENSES TO manufacture the salt-cooled valve developed by the Eaton Manufacturing Co., Cleveland, Ohio have been granted to the Rolls-Royce Company of England and the Hispano-Suiza Co., of France for use in their automobile and airplane engine motors, according to C. W. Miller, president of the Wilcox-Rich division of the Eaton Company. Mr. Miller also stated that immediate shipments will be begun on a large order for valves received from one of the country's largest airplane engine builders.

The valves are made with hollow stems and heads, the hollow part being partly filled with metallic sodium which has the property of liquefying under heat and then adhering to the hot steel of the valve. Through the agitation of the liquid, the valve heat is taken from one portion of the head or stem and transferred to other and cooler portions where it is carried off by radiation.

Roof Marking on CWA Program

COMMUNITIES WHICH as yet are not identified by roof markings visible to fliers can obtain such markings as a result of the Civil Works Administration reemployment program. Although there are 16,598 incorporated cities and towns in the United States, it is understood that not more than 2,000 are roof-marked at the present time.

Civil Works funds are now available for both the labor and material involved to those cities which care to take advantage of this feature of the Federal government's recovery activities.

Pilots Outnumber Aircraft

THERE WERE two pilots for every licensed airplane in the United States as of January 1, 1934, according to a survey of a report issued by the Aeronautics Branch of the Department of Commerce which shows 13,960 licensed pilots and 6,896 licensed aircraft. Both figures also indicate a decrease over the corresponding totals taken a year ago, January, 1933, when there were 18,594 licensed pilots and 7,330 licensed aircraft.

The decrease in the number of pilots is held to be due in part to the reversion of many private and solo licenses to the student grade when the private pilot requirements were raised and the solo license discontinued. This is shown by the fact that on January 1, 1933, there were 8,038 student licenses while on the first day of January 1934, this number had increased to 11,469.

The licensed pilots were divided into the following groups: 7,103 transport; 1,070 limited commercial; 16 industrial; 4,505 private and 1,266 solo. California had 2,622 licensed pilots; New York, 1,353 and Illinois had 880.

California also was the home state of the largest number of licensed aircraft, 1,030. New York and Illinois retained their high positions in this category with 915 and 623 respectively.

The study of gliders revealed there were 641 licensed and unlicensed ships of this type with licenses issued to 149 glider pilots.

C-W Exports Increase

THE PAST YEAR was the best from an export standpoint in the history of the Curtiss-Wright Export Corporation, according to John S. Allard, president, who reported such shipments during 1933 totaled $3,550,000, an increase of 35 per cent over the preceding year.

The export shipments entailed 105 airplanes, 91 Wright engines and several Curtiss Conquerors. The aircraft included Curtiss Hawk single-seater fighters, Curtiss Falcon observation planes and the Curtiss-Wright Osprey fighters. Engines exported included the Whirlwind and Cyclone types.

Countries receiving Curtiss-Wright shipments included Russia, Japan, China, Germany, Spain, Poland, France, Switzerland, Holland, Italy, Czechoslovakia, Sweden, Bulgaria, Colombia, Chile, Peru, Bolivia, Venezuela, Argentina, Brazil, Mexico, Guatemala, Honduras, Santo Domingo, Porto Rico, Cuba, El Salvador, Canada, Alaska, Australia, Philippines, Turkey, Dutch East Indies and Ecuador.

Arrangements have been completed with Frank Hawks to go to China to demonstrate the new Curtiss-Wright bomber to the Chinese Government.

Two Planes, Six Engines Get A. T. C.

RECENT APPROVED type certificates issued by the Aeronautics Branch of the Department of Commerce cover two models of aircraft and six models of aircraft engines as follows:

Security National Aircraft Corp., Downey, Calif., model Airster S-1A, two-place open land monoplane powered by a Kinner K-5, 100-horsepower engine. Weights: empty 1,197, useful load 555, gross 1,752. A.T.C. No. 521.

Kinner Airplane & Motor Corp., Glendale, Calif., model Sportster B1, two-place open land monoplane powered by a Kinner B-5, 125-horsepower engine. Weights: empty 1,197, useful load 678, gross 1,875. A.T.C. No. 522.

Pratt & Whitney Aircraft Corp., E. Hartford, Conn., model Wasp Junior T1B, nine-cylinder, radial, air-cooled engine rated 345 h.p. at 2,000 r.p.m. Octane 73. A.T.C. No. 113.

Pratt & Whitney model Hornet SD1, nine-cylinder, radial, air-cooled engine rated 575 h.p. at 2,050 r.p.m. at 2,000 ft. Octane 73. A.T.C. No. 114.

Pratt & Whitney model Hornet SD1-G, geared 3:2, nine-cylinder, radial, air-cooled engine rated 575 h.p. at 2,150 r.p.m. at 3,000 ft. Octane 73. A.T.C. No. 115.

Pratt & Whitney model Hornet S1D1, nine-cylinder, radial, air-cooled engine rated 525 h.p. at 2,000 r.p.m. at 4,000 ft. Octane 73. A.T.C. No. 116.

Pratt & Whitney model Hornet S3D1-G, geared 3:2, nine-cylinder, radial, air-cooled engine rated 670 h.p. at 2,150 r.p.m. at 5,000 ft. Octane 80. A.T.C. No. 117.

Wright Aeronautical Corp., Paterson, N. J., model Cyclone SR1820F33 (including SGR1820F33, 635 h.p.) geared 8:5 or 16:11, nine-cylinder, radial, air-cooled engine rated 650 h.p. at 1,950 r.p.m. at 9,500 ft. Octane 80. A.T.C. No. 118.

Year's Plane Production Lower

PRODUCTION OF aircraft for the commercial market far exceeded that for the military market during 1933, according to a report issued by the Aeronautics Branch of the Department of Commerce which showed a total production of 1,324 aircraft for the year. Planes for domestic use numbered 677, while 331 were for the military market and 316 for export purposes.

In 1932, the number of airplanes produced was 1,396 of which 667 were for domestic civil use, 500 for military delivery and 229 for export.

In the domestic civil category, production in 1933, showed 506 monoplanes, 164 biplanes and 7 autogiros. For the year 1932, production in the same group was 481 monoplanes, 165 biplanes and 21 autogiros.

Boeing Completing Transports

WITH THREE of the planes already completed and with others rapidly nearing completion on the assembly line, work is progressing steadily at the Boeing Airplane Company's Seattle plant on its project of additional high-speed, twin-engined passenger and cargo transport planes. Completion of the entire order is expected before summer, with United Air Lines to take some of the fleet.

Construction of the additional ships increases the number of planes in the transport project to 75, United Air Lines taking 60 during 1933.

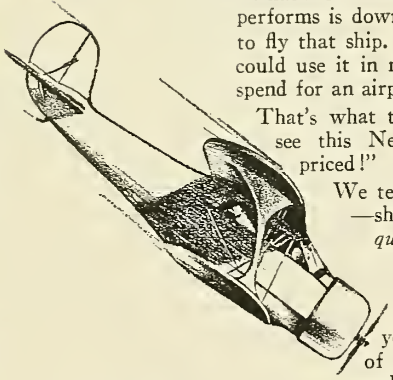
Plan Plane-a-Week Production

ONE COMPLETE plane each week is the temporary manufacturing schedule of the Harper Aircraft, Inc., of Youngstown, Ohio. The company, which is now using the Bernard Airport hangar as its factory, was formerly located in Elgiria, where it had built six experimental planes.

The first test flights at the Bernard airport were made by J. L. Harper, president, and M. R. Link, test pilot. A quantity of equipment is on hand and work on another low-wing, light weight plane has already been started.

(Continued on following page)

BUT.......
I haven't $10,000



"That New Beechcraft is a sweet airplane. The way she performs is downright uncanny; I'd even trust my wife to fly that ship. . . . You bet, I would like to own it; could use it in my business. But I haven't $10,000 to spend for an airplane. . . ."

That's what they all seem to think when they first see this New 225 h.p. Beechcraft — "too high priced!"

We tell them about its low maintenance cost —show them that the cost per mile *is frequently lower than the mileage costs of other forms of transportation.*

But always the conversation comes back to the initial cost. If, however, you handed us a $10,000 bill for one of these New Beechcrafts, the change we would give back to you would buy an ultra-modern automobile.

If you are interested (in the Beechcraft, not the automobile) tell your secretary to ask us for further information.

170 M.P.H.
Comfortable
for
4
Persons

The Beech
Aircraft Company
WICHITA, KANSAS

(*Continued from preceding page*)

Speed Keynote of Shushan Races

TWO NEW official world's records for speed and an interesting program of precision, acrobatic and race flying featured the Pan American Air Races at the newly dedicated Shushan Airport, New Orleans, La. Inclement weather forced a postponement of the races, originally scheduled to begin February 9, the day the new $4,000,000 airport was officially dedicated before 3,000 persons and the Governor of the state, Oscar K. Allen, Mayor T. Semmes Walmsley of New Orleans and Col. A. L. Shushan.

The first day of the races saw a new world's speed record for land planes when S. J. Wittman of Oshkosh, Wisc., flew 62.137 miles in 27 minutes 6.7 seconds over a five-mile course in a plane of the fourth class type weighing less than 400 pounds. His speed was 137.513 miles an hour, or 221.307 kilometers per hour. Other high speeds the first day were attained by Art Chester, 205.39 m.p.h., Harold Neuman, 221 m.p.h., and Lee Miles, 197.15 m.p.h. Miles, later in the program, reached a top speed of 202.5 m.p.h., while Neuman attained 231 m.p.h.

On the third day of the events, Jimmie Wedell set a new record for land planes at 100 kilometers by flying one of his own ships at a speed of 266 miles an hour, against the old record of 249 miles an hour.

Ralph Bushey won the Shell Trophy sweepstakes award by amassing eleven points, one more than Gordon Isreal. Until the final day, Neuman was in the lead for the trophy, but, in the deciding race, came in last and finished third in the final tabulations.

The aerobatic fliers included Harold Johnson and his tri-motored Ford, Dick Granere and his "crazy flying" act; Milo Burcham, inverted flier, Michel Detroyat, European aerobatic ace brought here by the Stanavo Specification Board, Roy Hunt and Art Davis. Clem Sohn, Roger Don Rae and Jerry Wessling were among the parachute jumpers performing.

The race was conducted by Cliff and Phil Henderson who were assisted by T. H. "Doc" Kincaid, technical chairman; Bob Dake, chief starter; Dick Fell, chief of operations; Hal Henning and Jimmie Doolittle, referees and Bill Enyart, NAA representative, and A. A. Watters, chief judge.

The Shushan Airport itself is most modern in construction and is said to be the finest of its type in the country. The administration building, its concrete construction finished off in smooth stucco to give the effect of brown sandstone, is one of the largest seen in this country.

TWO WACO PLANES FOR THE NAVY

TWO WACO Model F-2 biplanes have been delivered to the U. S. Navy, and will be assigned to the U.S.S. *Macon* for use in transporting non-flying personnel.

Other than providing for the installation of the necessary gear for attaching the ships to the dirigible, no structural changes were made in the planes which are stock production models. Carrying two passengers and the pilot, the F-2's will provide transit between the dirigible and ground or carrier points. A compartment to carry a life raft is directly back of the rear cockpit, and is equipped with a quick releasing device in case of a forced landing upon the water.

The ships are powered with the standard Continental seven-cylinder engine which develops 210 h.p. at 2000 r.p.m.

Fairchild Plane to Map in Asia

A FAIRCHILD 71, recently manufactured by the Fairchild Airplane Co., for the Standard Oil Company of California, is now on its way to Asia by steamer to be used for reconnaissance mapping work. Pilots Kerr and Rocheville who will be in charge of the plane, have with them enough supplies and spare parts to last for some time. They expect to be gone about a year.

The Standard Oil Company plans to map large areas of Asian oil concessions. F. A. Galligan, Fairchild representative on the West Coast, headquartering in San Francisco at the San Francisco Bay Airdrome, cooperated with the oil company in arranging all details.

Morane-Saulnier acrobatic plane flown by Michel Detroyat at New Orleans races

PITTSBURGH AVIATION INDUSTRIES CORP.

(*Continued from page 28*)

An extensive survey was carried out with a view to replacing the equipment then in use with that of a type more in keeping with major airline operations.

As a result the line was re-equipped with Stinson tri-motors by June, 1931, and was ready to embark upon a program of expansion, signalized by the extension of air mail service from Pittsburgh to Washington, during the same month. Simultaneously, the schedule was increased to three round trips a day for passengers, mail and express between Cleveland, Akron, Pittsburgh and Washington, although the night mail flight was discontinued.

Intensive efforts were, and have continued to be, exerted towards increasing traffic which has resulted in a steady advance in the number of passengers, pounds of mail and pieces of express carried. Passenger traffic jumped up by 100% in 1931, and approximately 50% in 1932, while 1933 figures show that Pennsylvania Air Lines enjoyed the greatest passenger density of any airline per schedule.

In 1931 and subsequently, steady progress has been made in the improvement of the service. A complete maintenance base was established at Cleveland and two crews of mechanics employed to work on day and night shifts, thus assuring the mechanical condition of planes and engines at all times. A two-way radio communications system was installed and all planes were completely equipped with blind flying instruments, resulting in considerable increase in operating efficiency.

The year 1933 saw further expansion of the company's activities. Increased passenger demand necessitated the addition of a further round-trip to the schedule in June, and immediately thereafter, Ford tri-motors were placed into service. The new equipment enabled further refinements, including co-pilot service, and added materially to the popularity of air travel over the line.

As a result of this continued development, the company had in service before the end of 1933 a total of twelve airplanes, and had since its organization piled up a total of almost two million miles. In the Penn School of Aviation Division there were a further nine training planes in active use.

Thus today the organization is a most complete unit comprising as it does Pennsylvania Air Lines operating between Cleveland, Akron, Pittsburgh and Washington; the airport division operating the Pittsburgh-Butler Airport and the training division, operating the Penn School of Aviation.

TRADE LITERATURE

Caterpillars in Winter

• A TIMELY folder issued by the Caterpillar Tractor Co., Peoria, Ill., is the one showing various models equipped with snow-removing devices. Among the illustrations are the Caterpillar V-type snow plow, Caterpillar tractor and loader and the Caterpillar blade snow plow in action. Airport managers should find this folder useful when planning how to keep their airports free from snow.

Nickel in Aircraft

• THE PART played by nickel and its alloys in recent record-breaking flights is noted in a recent issue of Nickel Steel Topics, published by the International Nickel Co., New York, N. Y. The round-the-world flight of Wiley Post in the *Winnie Mae,* the record-breaking speed dash of Jimmie Wedell and the Balbo Squadron flight to the United States are mentioned.

Nickel alloy steels were used in the Post and Wedell P. & W. Wasp engines, while numerous parts in the engines of the Savoia Marchetti S-55X flying boats, employed similar metals.

Aviation Radio Equipment

• A TWENTY-SIX page booklet issued by the Western Electric Co., New York, N. Y., pertains to aviation communication equipment, with particular reference to type 208. It contains a description of the two radio telephone systems for aircraft, a description of the apparatus used, remote control mechanisms and accessories, dimensional drawings and other information.

Photographs show equipment installed in a Lockheed Orion, typical antenna installations of a Stinson, Fleetster and Boeing 247 transport together with a table layout of the 208 type radio telephone equipment. The section on dimensional drawings was found particularly interesting and instructive.

Engineering Data

• ALLEN MANUFACTURING Company, Hartford, Conn., manufacturers of hollow screws, has prepared a booklet of engineering data showing the holding power and proper sizes of hollow screws to use.

Tables indicate the holding power and recommended sizes of set screws and the recommended tightening force of cap screws. Among the information contained is found data on the proper size relationship between a cup point set screw and shaft diameter; recommended inch-pound tightening force; holding power of cup point set screws on various shaft diameters; holding power of cup point set screws on flat surfaces; recommended tightening force of cap screws and a chart showing cap screw data.

Aircraft Instruments

• EVERY FORWARD step in the development of aviation finds instruments playing an important part. So-called "blind" or instrument flying is today practiced by practically every pilot. Implicit faith in the readings of the instrument panel has become an essential feature of flight training and technique. The booklet, prepared by Kollsman Instrument Co., Brooklyn, N. Y., on the manufacture and description of their complete line of instruments, is therefore extremely instructive and interesting.

A description, outstanding features, operation and installation diagram of each of the instruments manufactured by the company is contained therein, all written in concise and interesting form. Among the instruments catalogued are the various types of sensitive altimeters, level flight indicator, air speed indicator, altimeter, magneto-electric tachometer, compass, aviation compass, fuel quantity gage, manifold pressure gage, engine gage unit, engine tachometer, ice warning indicator and cabin thermometer. Photographs in actual size and installation diagrams are also included.

Demonstrating the Gyroscope

• AN INTERESTING 24-page booklet prepared by the Sperry Gyroscope Co., manufacturers and developers of gyroscopic instruments and marine equipment for a period of more than 20 years. Chapters explain the versatility of the gyroscope; demonstration of the gyrostabilizer; the gyro compass; the artificial horizon and directional gyro; the automatic flying pilot and salient features of the principal of gyroscopic instruments.

Profusely illustrated and well indexed, "Demonstrating the Gyroscope" has been found interesting and informative on this most absorbing topic.

Hoists for Industry

• A NEW bulletin on "Hoists," designated No. RH-1, has just been issued by the Harnischfeger Corp., of Milwaukee. This interesting publication treats upon the application of hoists to both general and specific problems. Illustrated in color with photographs and diagrams explaining simplified construction and operation, it covers the vital points in modern hoist design. The bulletin lists the ratings and operating ranges for type "R" hoists along with specifications and electrical accessories. Copies may be had from the company, its agents or representatives.

Precision Ball Bearings

• ONE OF the most interesting booklets on precision bearings for aircraft controls is the new catalog F-936 just issued by Norma-Hoffmann Bearings Corp., Stamford, Conn., manufacturers of precision ball, roller and thrust bearings. This 16-page booklet, illustrated with photographs and drawings, contains descriptions, tabulated specifications and load ratings of the types of precision ball bearings most commonly used today in various aircraft controls.

Seventeen different types of bearings including metal and felt seal offered in radial and self-aligning single or double row units, are illustrated together with tabulated information on their specifications and load ratings. In addition information is given on standard Army-Navy ball bearing equipped pulleys, typical control applications, other aircraft applications and illustrations of other types of bearings used in aircraft. The design engineer should find this booklet useful as a ready reference to many of the control problems in aircraft.

Fastening Products

• IN THE fourth edition of the Parker-Kalon Corp. catalog, there is presented complete information and technical data relating to the use of the various types of screws and nails manufactured by the company. Its 36 pages are full of suggestions that may be of inestimable value to the engineer in his fastening problems. The catalog tells how and where these products are used to reduce manufacturing costs, speed up production and in making assemblies.

Diagrams indicate comparative strength of fastenings under tension and shear; tables show sizes of holes recommended for various type screws, strength of various types and stock sizes, weights, packing, finishes, etc.

Spray-Painting Equipment

• DE VILBISS Company, Toledo, Ohio, has issued a new catalog known as the DB. Covering in condensed form its line of spray-painting equipment, the booklet gives complete spray-painting equipment for exterior painting, interior decorating and refinishing, as well as equipment for automotive and specialty products. Complete specifications and prices are given for each product listed, while an index at the front provides ready reference.

A copy of the catalog may be secured on application to the company.

(Continued on following page)

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Welding and Riveting Aluminum

• THE ALUMINUM Company of America has just issued revised editions of the booklets, "The Welding of Aluminum" and the "Riveting of Aluminum," giving the latest information on joining aluminum. These books include much data not contained in the earlier editions and are artistically put together.

The book on riveting contains 24 pages featuring such topics as the strength of riveted joints, design proportion of riveted joints, driving procedure, selection of rivet alloy and a special section devoted to aircraft riveting. Numerous tables, drawings and photographs help make the book both instructive and attractive.

Forty-two pages are applied to the welding of aluminum. Chapters are devoted to fusion welding and resistance welding with such subdivisions as torch welding, apparatus, flame adjustment, torch manipulation, strength of welds, use of jigs, preparation of sheets, etc. There are more than 16 photographs and numerous drawings.

Router-Shaper Instructions

• IN CONNECTION with the announcement of an electric router and shaper, the Stanley Electric Tool Co., of New Britain, Conn., has issued a 40-page book, giving instructions for the care and use of these tools, together with the uses to which they can be put. The reader is advised of the various jobs which can be performed with the tools and is instructed how to make various cut-outs, designs, molding cuts, etc.

Numerous sections are devoted to the bench router and shaper, while three pages are devoted to illustrations of common wood joints.

X-Ray of Metals

• THE PRIMARY motive underlying the preparation of the booklet "X-Ray for Industry" is the presentation of Philips "Metalix" X-Ray equipment as a new tool for industry.

This 35-year old science of X-rays is now broadening from the stage of pure or academic science to that of applied or industrial science. This booklet aims to tell what this new tool is, how it may be used in industry, what results it produces and why it can profitably be applied to problems of every day life. It is the expression of a conviction that X-ray research and control methods can now be of invaluable service in the solution of problems of constitution and practical behavior of metals and alloys of every kind of catalyst, textile fibre and numerous other substances.

Included in the illustrations are two photographs pertaining to aviation. One shows the portable X-ray unit at an airport where mechanics are making their regular periodic inspection of a transport plane and the other depicts Prof. Piccard inspecting his stratosphere gondola after his flight.

The Industrial X-Ray Corp., of Los Angeles, Calif., manufacturers and distributors of the instrument in the United States, are the publishers.

Shushan Airport

• COMMEMORATING THE formal opening of Shushan Airport, New Orleans, La., a well-written and profusely illustrated book has been issued by the Board of Commissioners of the Orleans Levee Board. Sections are devoted to a story of the airport, its engineering features, aviation in New Orleans and some interesting facts concerning the city. The illustrations depict various views of the field and portraits of the men who were responsible for its construction. There are a number of drawings, including the first and second floor plans of the large administration building, and a general plan of the airport.

Instruments

• TWO FOLDERS just issued by the Brown Instrument Co., Philadelphia, Pa., are interesting. One features the announcement of the new Brown Thermometers and Pressure Gauge and the other illustrates and describes briefly the line of indicating, recording and controlling instruments for the measurement of temperature, flow, per cent of CO_2, pressure, speed and liquid level.

Describing the thermometer and pressure gauge, the booklet illustrates five of its outstanding features such as a standard electric chart drive; automatic pen release; elimination of chart knob; switch to start and stop chart drive and a combination door handle and built-in lock.

• BOOK REVIEWS •

AIRWAYS OF AMERICA

By Prof. A. K. Lobeck

• THE VARIETY of things observed from the air is astounding. That they are overlooked by the average air traveler is perhaps hardly realized because most of us ourselves are not well versed in geology, physiography, agriculture and farming, types of natural vegetation, the forms and meanings of clouds and other geographical phenomena. A guidebook designed to remedy this situation has just been prepared by Prof. A. K. Lobeck of Columbia University, New York, who tells about the country lying along the route of United Air Lines from New York to San Francisco. The panorama of the country has been divided into 39 sections, each being treated separately, with bird's eye drawings showing in detail the mountains, plains, rivers, and other geographical features, as well as cities and towns.

Over 200 pages are devoted to the geographical descriptions in the publication which was financed by the Kemp Memorial Fund and distributed by the Geographical Press of Columbia University.

STRESSES IN AIRPLANE STRUCTURES

By H. B. Howard

• A THIRTEEN chapter book published by the Pitman Publishing Co., New York, N. Y., is a collection and discussion of those portions of the theory of structures that are of importance in airplane design. "The Stresses in Aeroplane Structures" by H. B. Howard, a fellow of the Royal Aeronautical Society, contains 159 diagrams and illustrations.

Much of the material is an attempt to remedy the lack of information on the classical theory of structures. The author's method of treating beams in compression by polar coordinates has been introduced and an account of strain energy methods of analysis is included. Among other topics are airplane loads, calculation of stresses in monoplane and biplane structures, torsion, tapered struts and the bending of beams.

PROPERTIES AND STRENGTHS IN MATERIALS

By J. H. Haddon

• SEVERAL EXCELLENT treatises on airplane stress analysis are available, but more of them cover adequately the strength analysis of detail design. Mr. Haddon's text gives an excellent, though brief, review of the theories and properties of airplane materials, but its main value lies in its thorough treatment of the strength of detail design. Thus one chapter covers Riveted Joints, Wiring Lugs, Thin Cylinders, with every example selected from airplane practice. A chapter entitled Special Cases, takes up tubes in tension, etc. Combined bending and compression and the theory of struts are particularly well covered.

This book, published by the Pitman Publishing Co., New York, N. Y., should be valuable to students and practitioners of the art of stress analysis, and to detail designers and draftsmen in aviation who wish to base sizes on something more than guesses and experience.

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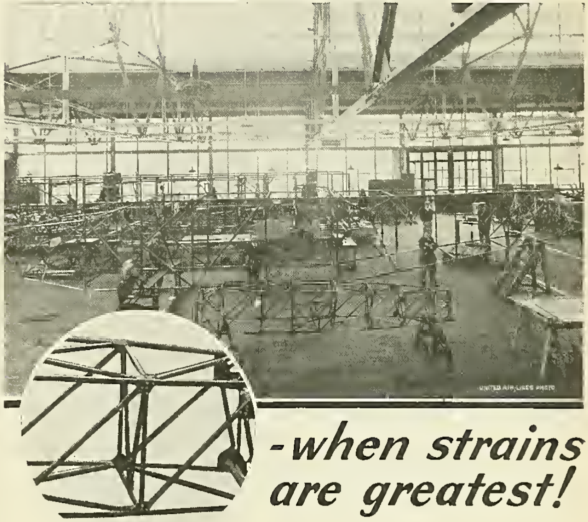

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• FOREIGN NEWS IN BRIEF •

Australasia

QANTAS, LTD., is now operating the Daly Waters-Birdum Creek service and maintains this 50-mile section because it is essential in providing the air mail link between the terminal at Daly Waters and Birdum which has been temporarily, at least, abandoned by the Larkin Aircraft Co. The company recently augmented its fleet of planes with a De Haviland *Fox* Moth which it has outfitted as an ambulance plane.

PLANS FOR an airline service covering almost all of New Zealand have been announced by W. Kingsford Smith. The company, to be known as Dominion Airways Co., will operate without subsidy and will use three Codock planes made in Sydney. In addition, two other planes will be used for feeder work. Sir Charles Kingsford Smith is financially interested in the new enterprise.

BIDS FOR air mail service have been asked for numerous routes in the Commonwealth. Among these routes are Melbourne and Hobart, Cloncurry and Normanton, Ord River and Wyndham and the Darwin-Singapore section of the air mail service from London to Australia. Several feeder lines are also included in the government's requests for air mail service.

A CONSIDERABLE amount of unemployment relief funds has been absorbed in improving the more important airports under government control. These include Mascot, Essendon and Archerfield at Sydney, Melbourne and Brisbane respectively, as well as airports on the route to Darwin. The appropriation for Darwin has been increased in contemplation of the inauguration of the service from Singapore and in anticipation of the MacRobertson air race.

AN INTERESTING attempt to fight the locust plague from the air is being made this year in Rhodesia. A somewhat obsolete tri-motored airliner has been equipped with a special spraying apparatus which can spread a poison barrage of sodium arsenite before the swarms of locusts as they pass over the country. When the locust swarm is located, the pilot plans to fly along the front, spray poison into the air and hope that the locusts will fly into it. The powder is fine enough to remain suspended in the air for some time and is potent enough to destroy the pests if they come in contact with it.

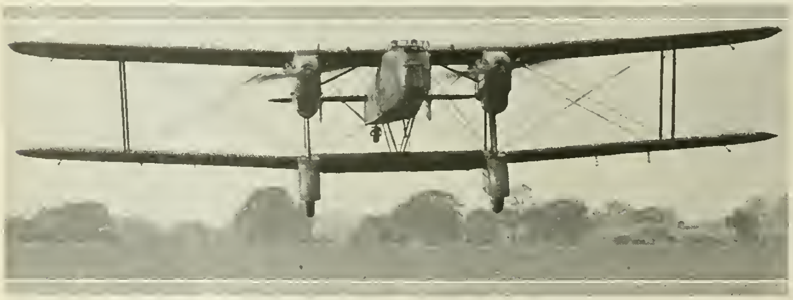
AN AIRCRAFT with a new-type wing has successfully been flown at Brough airport in Yorkshire. The plane is a small, bi-motored metal monoplane featuring a wing made of a single tubular spar of duralumin to which are attached the ribs and other lighter members; the spar is hollow and a portion of it is used as the fuel tank.

Canada

FIRST REGULAR air mail service to the Arctic Ocean was made with the inauguration of service from Edmonton to Coppermine, on Coronation Gulf, Arctic Ocean, one of the outposts of Canada's northland. Pilot Walter Gilbert of Canadian Airways flew the first mail from Cameron Bay, Great Bear Lake, 150 miles to the south of Coppermine. The service will be maintained all year with scheduled monthly trips.

THE TORONTO Flying Club, with over 1,300 hours to its credit for 1933, did more flying than any of the other 22 Canadian government sponsored clubs. In order to stimulate more interest in flying, the membership fees of the club were reduced from $25 to $10 annually. The club has also equipped one plane for blind flying. Officers elected for the year were: president, Wilfred A. Curtis; vice-president, Ernest O. Houghton; treasurer, Frank James; secretary, R. E. Nicoll, and directors, T. M. Reid, Arthur Flack and George Anderson.

DE HAVILLAND Aircraft of Canada, Ltd., finished 1933 with a smaller net loss than the previous year, because of drastic economies, it was stated at the annual meeting of the company. Stockholders were informed that reduction in government appropriations for aviation played a large share in the reduced income of the company. Lee Murray has been named managing director in place of R. A. Loader, who has gone to England with the parent company.



143 m.p.h. Heyford night bomber built by Handley Page for the Royal Air Force

LANDING fields for the trans-Canada air route should be completed by the end of summer if work continues as rapidly as at present, according to J. A. Wilson, Controller of Civil Aviation. Following an inspection of some of the fields, Wilson said that fully equipped sites will be spaced some 250 miles apart and that others will be about 25 miles from each other.

NEW COURSES of instruction are being offered by the Vancouver Aero-Tech. They include a two-nights-a-week mechanics' course, a full-time mechanics' course and a commercial pilots' course covering information required for technical examinations for a commercial pilots' license.

Czechoslovakia

CONSTRUCTION OF the new Prague airport is well under way at Ruzyn, suburb of the Czechoslovakian city. The airport will cost in the neighborhood of $3,500,000 and its construction will entail the removal of some 500,000 cubic meters of earth. Over 500 men are employed on the project.

A NATIONAL aviation collection in Czechoslovakia is expected to total about $570,000, according to an opinion credited to the Masaryk Aviation League, which, with the Ministry of the Government, is receiving gifts to aid in the improvement of equipment and other defense facilities. About four-fifths of the anticipated total has already been collected.

THE AIRPORT at Prague is to be improved by the addition of a new administration building which will house the meteorological, customs and other offices, a modern waiting room and a restaurant.

Germany

A SUCCESSFUL summer season in 1933 has made it possible for Deutsche Luft Hansa to continue its services during the winter months, the first time it has

(*Continued on following page*)

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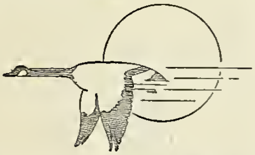

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(*Continued from preceding page*)

been able to do so since its organization. Previously, at least three winter months experienced discontinuance of airline service. The international and important local services are continuing to operate under conditions which indicate public approval.

THE SOUTH ATLANTIC flights by way of the *Westfalen* are being continued by Deutsche Luft Hansa. A Dornier Wal recently flew from Bathurst to the ship which stood 820 miles out in 7 hours 40 minutes. Another plane, catapulted from the *Westfalen* upon the arrival of this plane, proceeded to negotiate the 1,440-mile flight to Natal in 9 hours 40 minutes.

ONE OF THE newer German light planes is the Erla Me.5a a single-place, low-wing cantilever type designed for sport, touring and aerobatic use. The detachable wings have two main spars and are covered with diagonal plywoood, except for the trailing edge, which is fabric-covered. The fuselage is of wood construction and is plywood covered. Due to its engine, which is a D.K.W. two-cylinder, water-cooled, two-stroke affair of about 20 h.p at 3,500 r.p.m., the plane is expected to sell for less than $1,000. Performance figures indicate a top speed of 78 miles an hour, ceiling of 11,480 feet and a range of 373 miles.

Great Britain

NAPIER & SON, Ltd., has just developed two new air-cooled aircraft engines, both evolving from the Series I, H-type model. These new engines, the Series II and Series IV *Rapiers,* are of unique design and embody several novel features of construction. The arrangement of the cylinders results in a small frontal area which is about 35 per cent of that of the orthodox air-cooled radial engine per horsepower. Cooling has been accomplished by the adoption of baffle plates which direct the air flow where it is required to give equable and safe cylinder temperatures. The Series II engine is rated 305 b.h.p. at 3500 r.p.m. at 10,000 ft., while the Series IV is rated 340 b.h.p. at 3500 r.p.m. at sea level.

ROYAL AIR FORCE squadrons will cruise thousands of miles again this year in formation flights over land and sea. The first large-scale flight of 1934 began early in January when a formation of four single-engined and two bi-motored planes flew from Baghdad to Singapore, a journey of 5,314 miles. The longest flight of the year was scheduled to begin February 26 when five Fairey 3F single-engined biplanes and four Vickers Victoria troop carriers were to take off from Cairo in Egypt to Pretoria in Central Africa and return. Two flying boat cruises will also be undertaken; the first will see the flight of a squadron of boats from Singapore to Hong Kong and return; the second will witness a flight from Basra along the coasts of Arabia and India to Ceylon and Calcutta.

A STIMULUS to travel between England and France has resulted in the decision of the authorities of both countries to abolish the necessity of passports for week-end trips. As a result, Imperial Airways is making plans to reduce the rates for the week-end trips between London and Paris enabling passengers to leave on Friday night and return at any time up to the following Tuesday.

Italy

NEW TRI-MOTORED flying boats of the Savoia Marchetti S-66 type will soon begin flying over the S. A. M. routes. The planes were selected by the Air Ministry for the sea portions of the Italian airlines and are powered by 750-horsepower Fiat A. 24 engines.

THE CAPRONI 111 and 113 models are being demonstrated to the Chinese Government by Col. Mario De Bernardi, who is now in Shanghai. Added prospects for the export of Italian aircraft are seen in the recent visit of a Danish aeronautical delegation which completed a brief tour of inspection through the Caproni, Breda, Savoia Marchetti and Fiat factories. The Danish group consisted of Capt. Orum, Director of the Technical Office of Aviation; Capt. Bjarkow and Peter Nielsen, Director of the Military Factories of Aviation.

THE NET profit made by Aviolinee Italiane S. A. in the fiscal year ended June 1933 was 238,938 lires, following the accumulation of 571,912 kms., of flying during which 13 flights out of 1,587 scheduled were not completed. The company flies from Milan to Rome, Turin, Munich, Berlin and Zurich.

Mexico

AS AN official gesture of Mexico's friendship for Spain and to return the courtesy of the tragically incompleted flight of the Spanish pilots Barberan and Collar, Francisco Sarabia, Mexican pilot, is scheduled to make a non-stop flight from Merida, Yucatan, to Seville, Spain. Sarabia will fly a Great Circle course of 8,023 kilometers in a plane being built by order of President Abelardo Rodriguez in the National Aircraft Factory of the Department of War and Navy, Mexico, D. F.

Dr. Michael Watter, one of the Technical Editors of AERO DIGEST, was invited by the former President of the Sub-Committee of Construction, General Juan F. Azcarate, to design and construct the long-range plane, construction of which is well under way.

Recent news dispatches reported that Col. Roberto Fierro, Chief of the First Air Corps Regiment of Mexico, also plans a flight to Spain, but official sanction has not been placed on this venture. Col. Fierro plans to go by way of Buenos Aires and across the South Atlantic to Africa.

Sweden

NEW NATIONAL air routes are now being developed throughout the country by the construction of landing fields and the erection of a system of beacons. According to Col. Gabriel Hedengren, Secretary General of the Swedish Air Communications Association, a new type of beacon, developed by the Swedish Gas Accumulator Company, will likely win the competition for the selection of a suitable light. The beacon in question has a potentiality of 2,000,000 candlepower and can be seen 43 miles in clear weather and 19 miles in a haze.

UNEMPLOYMENT RELIEF funds may be appropriated for the construction of a number of airports throughout Sweden and the Air Communication's Association is endeavoring to induce many cities to develop suitable fields so that the development of aviation in the country may be fostered.

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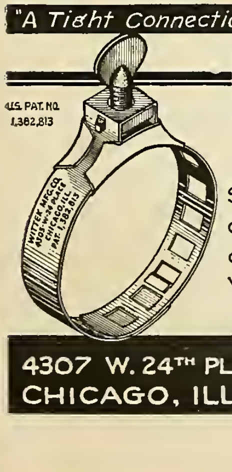

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THAT AIR RACE TO AUSTRALIA

(*Continued from page* 31)

Thanks to the interested co-operation of two American oil companies, gas and oil will be no problem. R. G. Ervin of the Shell Company informs us that along the entire route from London to Melbourne Shell has a complete aviation refueling organization which will be prepared to render exceptionally efficient and rapid service to all of the competing pilots. The Shell bases between Amsterdam and the Dutch East Indies are used constantly by the Royal Dutch Air Line (KLM). A high quality 73 Octane fuel is at present available along the route, but special fuels of higher Octane ratings will be made available for those pilots requiring special fuels. Shepard Dudley, secretary of the Stanavo Specification Board, Inc., advises us that the distributors of Stanavo products are arranging to have Stanavo Aviation Engine Oil and Stanavo Ethyl Aviation Gasoline of 87 Octane number available to contestants. Complete arrangements for these products and servicing can be made through the New York offices of both of these companies. As usual, the oil companies are displaying good sporting spirit and excellent business acumen in boosting an important aviation event.

Here is the handicap formula governing the handicap section of the race:

$$V = 140 \left(1 - \frac{0.2L}{W-L}\right) \left(\frac{P}{A}\right)^{1/3}$$

L = Payload in lbs.

W = All-up weight in lbs. of machine complete with gasoline, oil, *personnel* and freight ready for race.

P = Maximum horsepower at sea level at maker's normal r.p.m.

A = Wing area in square feet, including ailerons.

V = Air speed in miles per hour on which handicaps will be based.

(*a*) *Payload.*—The following only will be recognized as payload:

(1) 200 lbs. will be allowed for each person carried, together with his unsealed baggage; and

(2) All sealed packages of any description, including the following:

Excess baggage, spare parts, ballast, printed matter, etc.

For the purpose of sealing, all articles must be securely packed or wrapped.

(*b*) *Wind Allowance.*—Allowance will be made for general wind conditions existing over the course at the time of year during which the race is being run. This allowance will be determined beforehand and all nominators will know their full handicaps before the start of the race.

Here's something to bear in mind. The prizes for the Speed Race are: First, £10,000 and a gold cup valued at not less than £500. Second, £1,500. Third, £500. Handicap Race: First, £2,000; Second, £1,000. These amounts are payable, not in Sterling, but in Australian currency. Now far be it from me to look askance at any currency, but it seems to me that in view of Japan's military and naval preparations Australia's currency is on a sliding scale. At the present time £10,000 Australian is the equivalent of only £8,000 Sterling. And every time Japan launches another cruiser or destroyer the Australian pound drops off a few more shillings. By the time the race is run, the Australian pound may be computed in yen, instead of shillings. It's one of my most grievous ideas that eventually Japan is going to collect Australia, an almost vacant country, and add it to the Japanese Empire, which is no slouch of an Empire, because it's founded on the slogan "To hell with YOU!" Which is precisely the same slogan that England used for over a hundred years, and got away with it. If you don't believe me, read English history. And now Japan is getting away with the same thing, kicking the Kellogg Peace Pact, China, the League of Nations, and the United States in the pants, and nobody doing anything about it. England let Japan steal Manchuria from China because she thought that would keep Japan out of Australia. But it won't. Japan will take the Philippines from the United States and Australia from the British whenever she feels good and ready—and neither the United States nor Great Britain will be able to do much about it. That's my guess, anyhow. However, this won't affect immediately the value of those Australian pounds unless Japan gets to Australia before we do. If she does, the Japs will pay the winner off in sunshades, kimonas, and geishas—which might not be a bad idea, at that! Anybody can have my sunshade and my kimona.

PERSONAIRLITIES

(*Continued from page* 49)

Mexico, and stayed with the ship until he cracked it up, thus solving not only the problem of distribution, but the more vexing economic one of consumption. Meanwhile he was testing Martin planes for the Army and Navy, a job to which I fell heir in 1922, lasting until I asked for more pay, some 2½ years later.

In 1916 Floyd established three altitude records for seaplanes, winning the Aero Club of America Medal of Merit. Often on these flight tests he took Mrs. Smith along as observer on low and high speed, climb, etc. In those days, flight tests were all in the family, which was fortunate, as the airplane always passed its tests. When they insisted on Army or Navy officers looking at the instruments we began to have trouble.

In February, 1917, Floyd went to England for the Marlin Arms Corp'n, but when the United States went off its head and dived into the Europeans' private war, Floyd returned to be test pilot for the Army at Dayton, transferring on Oct. 14, 1918, to parachute experimental work at McCook Field. Earlier in the year of 1918 he had tried to interest the Army in his free type manually operated parachute idea, but without success. He believed in it though, and applied for a basic patent July 27th, 1918.

All known parachutes, European and American, were obtained, tested, and found inferior to Smith's free type pack. It was with a Smith parachute that Leslie Leroy Irvin made the first parachute jump in the world using a free type parachute, April 28, 1919. The present Irvin Air Chutes are manufactured under Smith patents, which have been upheld by two court decisions.

Leslie Irvin had formed the Irving Air Chute Co. in Buffalo in the summer of 1918 and had submitted his own attached type parachute to the Army. He was one of the first besides Smith to see the merits of the free type chute and to believe in its practicability; but Floyd Smith did the actual inventing and developing, a fact that is not generally known except to the United States Circuit Court and the Patent Office.

AIR—HOT AND OTHERWISE

(*Continued from page* 21)

ing the World War. Once the aviation football had gotten to rolling in the wrong direction under the advice and direction of these "New Dealers," no protest was heard from Major General Douglas MacArthur concerning the ability of the Air Corps hastily and practically over-night to take up the Nation's air mail load. His advice, if any, is not a matter of record.

What of the lives lost purely through ill-advised haste to change for the sake of change? What of the attempt of an Administration, presumably interested in the economic welfare of the nation, to discredit and wreck an entire industry for acts charged but not fully proven and for which government employees were co-operatively responsible? And what, incidentally, of the damage done to the name and prowess of the United States Army in the eyes of its civilian supporters who see but one side of the picture and that side chalked with what they believe to be an Army failure?

We have thrown out of the temple of government political office holders incapable of making, on behalf of the people, contracts considered fair and just in the eyes of another administration and installed in their places so-called constructive experts who turn out to be politically minded house wreckers.

Yes, we have had a change; but is it a change for the better? Is it progress?

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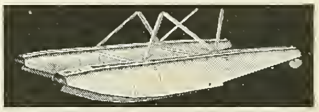

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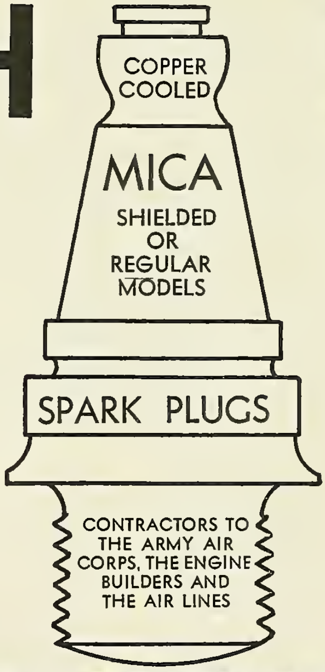
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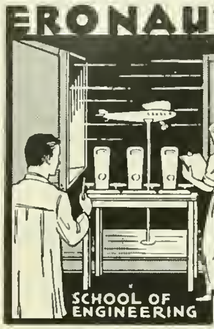

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ONE RACING HOLLEY carburetor for Warner motor, practically new, $60. Also used Warner parts and cylinders; or complete Warner knocked down, needing overhaul. Also one assembled complete Warner, $175. AERO DIGEST, Box 1729.

ENGINES: New seven-cylinder Jacobs; new Inverted American Cirrus; used J6-5. Slightly used Heywood starter for five-cylinder engine, $75. New pair 22 x 10-4 Goodyear Airwheels, with brakes, $75. Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

WRIGHT J-6 CRANKSHAFT: 2 cylinders, set J-6 propeller blades, cam, clutch and valves. This material in excellent condition. Cash. AERO DIGEST, Box 1732.

CONTINENTAL 165: 40 hours, $375; Kinner 210 C-5, needing overhaul, best offer takes it. Engine parts at 60-70% off list: Warner, Gipsy, J-5, J-6, Continental. Direct electric starter, 60% off. J-5 steel prop, recently etched, $100. AERO DIGEST, Box 1733.

WE HAVE A FEW used radio sets which have been factory reconditioned and are like new, available at $47.50 each, complete with headphones adn tubes. They are designed for the Department of Commerce Radio beacon and weather signals. Lear Developments, Inc., 157 Chambers Street, New York, N. Y.

EXPERT REPAIR WORK: All types planes. Only best obtainable materials and workmanship go into our repair jobs. Moderate prices. Approved repair station rating. We have enormous stock of surplus material. Write for bargain prices. Aircraft Mechanics, Inc., Colorado Springs, Colorado.

PROPELLERS: Lowest prices in the country. Steel props for J-5 and J-6. Brand new late production Hamiltons for all motors except OX, $20. Marshall and Bennett propellers for all motors. Central Air Service, Grand Rapids, Michigan.

AIRPLANE TOW BANNERS with scientifically built detachable letters. 1934 prices and terms. Discount to dealers. Your chance to make more money. Light plane banners. R. V. Trader, Mfg., Dravosburg, Pennsylvania.

NIGHT FLYING EQUIPMENT: Set of Pyle-National landing lights and Wiley flares with brackets and release handles, $75. Louisville Flying Service, Bowman Field, Louisville, Kentucky.

RYAN B-5 motor mount; Eastman wings; Stearman J-5 left lower; Model A Eaglerock parts; latest Waco C right upper, Waco F-2 center section and right upper; Lockheed parts. Charley Raudabaugh, 13210 French Road, Detroit, Michigan.

USED AIRPLANES AND PARTS: We may have just what you want. New or used parts. Wings, propellers, struts, etc. Pioneer Aircraft Supply, Airport, Syracuse, New York.

WINGS AND PARTS: Used and rebuilt wings for Waco 10, Waco F, Waco C, Travel Air, Eaglerock, Bird. Spars and ribs made to order. New London Aircraft Co., New London, Ohio.

Positions Wanted

EX-NAVY TRANSPORT pilot: Single, age 29, go anywhere. 650 hours, multi-motored rating, land and seaplanes, single- and multi-motored. Cross-country, over-water, night-flying and instrument flying experience. Clear flying record. Two years' experience as radio telegrapher. Complete mechanic. AERO DIGEST, Box 1713.

TRANSPORT PILOT: 600 hours barnstorming, cross country, etc. Radio license. Careful, clean record, all types. 2½ years college, 3 years business experience. Experienced stenographer. Desires position as pilot or pilot-secretary. Excellent references. Age 24, single. AERO DIGEST, Box 1714.

TRANSPORT PILOT: Competent instructor, mechanic, airline pilot, photographic, airport manager. Age 27. Speaks Spanish. Consider any offer. Go anywhere. Excellent reference. AERO DIGEST, Box 1719.

TRANSPORT PILOT with Ford trimotor desires connection with live wire outfit, or permanent location on busy airport. Passenger, freight, express. Contract or percentage basis. (No barnstorming.) AERO DIGEST, Box 1718.

TRANSPORT PILOT, mechanic. Employed. Wants steady work, living wage. Age 26, married. 725 hours, day, night, all weather. Experienced instructor, small fields, cross country. Excellent record. Fly anything, anywhere. Pilot, Marquette, Kansas.

AERONAUTICAL EXECUTIVES: Get in touch with this man. 28 years of age, unmarried, intelligent, ambitious; looking forward to aviation as life work. Believe my experience qualifies me for a position with an individual or firm engaged in aeronautical business; sales, traffic or service department preferred. Opening where I can work and study hard for promotion desired. References. AERO DIGEST, Box 1723.

Miscellaneous Services Opportunities, Offers, etc.

RADIO ENGINEERING: Broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Allen Street, Valparaiso, Indiana.

AVIATION: Air-minded young men, interested in entering aviation as apprentices. Write, enclosing stamp, to Mechanics-Universal Aviation Service, 12883 Mansfield, Dept. C, Detroit, Michigan.

WANTED: Connection for one or three airplanes. Have one Lycoming Stinson Jr.; one eight-place Wasp Stinson and one J-5 Waco. Will accept any good proposition. Will go any place. Pilot has over 4,000 hours day and night flying over land and water. AERO DIGEST, Box 1716.

WILL INVEST moderate sum in small aviation business. Prefer operation of hangar or small airport. Write full details. AERO DIGEST, Box 1721.

STUDENTS anticipating entering college and earning expenses: Write for 1934 edition of Student Handbook—How Universities Assist You in Working Your Way Through College. Enclose 25c. National Advisory Board, Dept. 2Y, 12883 Mansfield, Detroit, Michigan.

Classified Advertising

RATES * CLOSING DATE * PAYMENT

THERE is a minimum charge of $2.50 for classified advertising in AERO DIGEST, which permits the use of twenty-five words including name and address. For more than twenty-five words, the cost is ten cents per word. Classified copy is payable by check or money order, in advance of publication.

Initials, model numbers, street numbers, etc., count one word. For instance: T. N. Smith, three words . . . or Wright J6-9, two words . . . or 446 Eighth Avenue, three words.

The following sample advertisement will serve as a guide for wording and counting your own advertisements—

"FOR SALE: Waco Cabin, like new, Continental 210 h.p. engine,
1 2 3 4 5 6 7 8 9 10
165 hours, licensed until October 1934. Equipment includes turn and
11 12 13 14 15 16 17 18 19 20
bank, compass, fuel gauges, flares, cowl, pants. Will sacrifice for
21 22 23 24 25 26 27 28 29 30
$1,800. Write or wire John P. Jones, 123 Smith St., Brownsville, Texas."
31 32 33 34 35 36 37 38 39 40 41 42

Forty-two words; this advertisement would cost $4.20.

Forms for classified advertising in the April AERO DIGEST will close March 24th.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

Parachutes For Sale

PARACHUTES: Approved type. Seat, back, lap and chest; bought and sold; exchanged, repaired. Tell all first letter. Professional parachute jumpers and balloonists furnished for all occasions. Thompson Brothers Balloon and Parachute Co., Aurora, Illinois. Established 1903.

Wanted To Buy Or Trade

WANTED: A 125 to 175 h.p. radial motor and propeller, cheap for cash. C. Seawright, Sam Houston High School, Houston, Texas.

WANTED: OXX-6 engine and prop, in good shape. State type of mags and overhead, condition and time. M. Massini, 418 Main Street, Old Forge, Pennsylvania.

WANTED: Good OX or small air-cooled airplane; Monocoupe preferable. Will consider airplane needing little work. Send picture. William Picune, 743-34 Street, North Bergen, New Jersey.

WANTED: Cash for eight to fourteen place amphibion. Must be in good flying condition and priced right. Give full description. AERO DIGEST, Box 1720.

WANTED: Left lower wing for Swallow TP. Must be licenseable and cheap. C. A. Coons, 249 Academy Street, Jersey City, New Jersey.

WANTED: Complete Wright Gipsy motor or parts. Write air mail, lowest price and condition to J. E. Granger, Clover Field, Santa Monica, California.

WANTED: Right upper and lower wing panels for Parks P-1 airplane; also good used OX-5 propeller. Give prices first letter. Marathon Garage, Marathon, Texas.

WANTED: Less motor. Monocoupe, Monoprep or any plane licenseable with Velie. Have major overhauled Velie and prop, crated, $150. Uncompleted lightplane and seven-passenger Packard sedan. Willard Heft, Aitkin, Minnesota.

WANTED: Monocoupe Warner, Lambert or Velie; Warner Cessna or Aristocrat. Good condition; cheap. Will pay cash. Leslie Caraher, 7100 So. Shore Drive, Chicago, Illinois.

WANTED: J-5 Standard. Give complete description; hours on motor and ship, and lowest cash price. No junk or crack-ups wanted. Air wheels preferred. AERO DIGEST, Box 1722.

WANTED: Open OX ship or similar. Have for trade high class 16-inch "Oliver" heavy duty lathe, complete. Automatic quick change gears. Splendid condition. Lewis, Altona, Michigan.

WANTED TO BUY: Waco F, F-2 or C. Furnish complete description, history and lowest cash price in first letter. Address AERO DIGEST, Box 1724.

WANTED: Airplane, any condition, less motor. Also propeller for same. Give complete details and lowest cash price. Must be east of Mississippi. AERO DIGEST, Box 1731.

HAVE FOR TRADE Pitcairn biplane, new cover, new prop, motor overhauled. OX-5 turns up 1400 on ground. What do you offer? Prefer 2-place Aeronca. Watson S. Eaddy, Johnsonville, South Carolina.

WANTED: Stinson Model R. Give complete description, motor hours, condition, lowest cash price. Send photograph. Or will trade farm land near town. G. O. Paudler, Crosbyton, Texas.

WANTED: For cash, less J-6 330 h.p. motor, any good licensed 4- to 6-place cabin ship. Give full information and lowest price in first letter. Michigan Aero Motors, Jackson, Michigan.

CASH FOR STINSON JR., preferably with night flying equipment. Also other ships powered with air-cooled motors. Any condition. State all information and price in first letter. Central Air Service, Grand Rapids, Michigan.

WANTED: J-5, J-6, Lycoming, Warner, Lambert motors and parts. Any condition. Want used Edo 3300 and DeLuxe floats. Give description and price in first letter. AERO DIGEST, Box 1728.

WANTED: New Standard J-5, Curtiss Thrush or any good air-cooled ship. Give details and price in first letter. Luther West, 669 Milwaukee St., Menasha, Wisconsin.

WANTED: 330 h.p. Bellanca. Have J-5 Pitcairn to turn in. Balance cash. Give full information, prices and details in first letter. Becker-Forner Flying Service, Inc., Jackson, Michigan.

WANTED: Waco F, Monocoupe or similar ship. State all first letter: time, place, lowest cash price. Eastern states preferred. AERO DIGEST, Box 1736.

WILL TRADE Auburn "8" Convertible Sedan, OX Waco—either one and cash or both for air-cooled ship. Stinson, Waco F, Fleet preferred. Auburn 24,000 miles, excellent; Waco just recovered, licensed; motor only 50 hours. Write AERO DIGEST, Box 1738.

Help Wanted

WANTED: Advance man for Trimotor. Must know country and have experience. Should have car. Good proposition for hard worker. Wire Dale Smith, Springfield, Missouri.

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Selection of Airfoils: Data and methods for comparing airfoils. Reasons for varying values of gap/chord ratio and stagger. Decalage. Pressure distribution tests. Mean chord of a combination of airfoils. Downwash.

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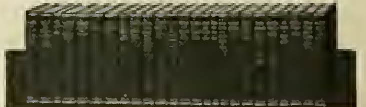

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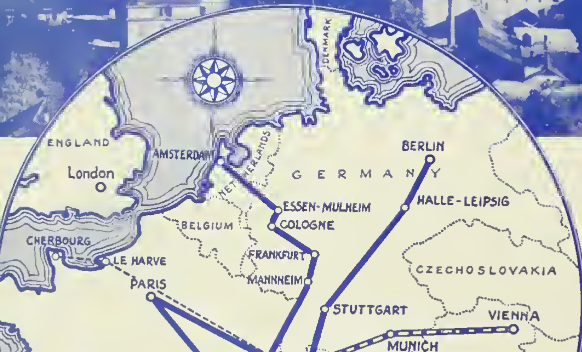

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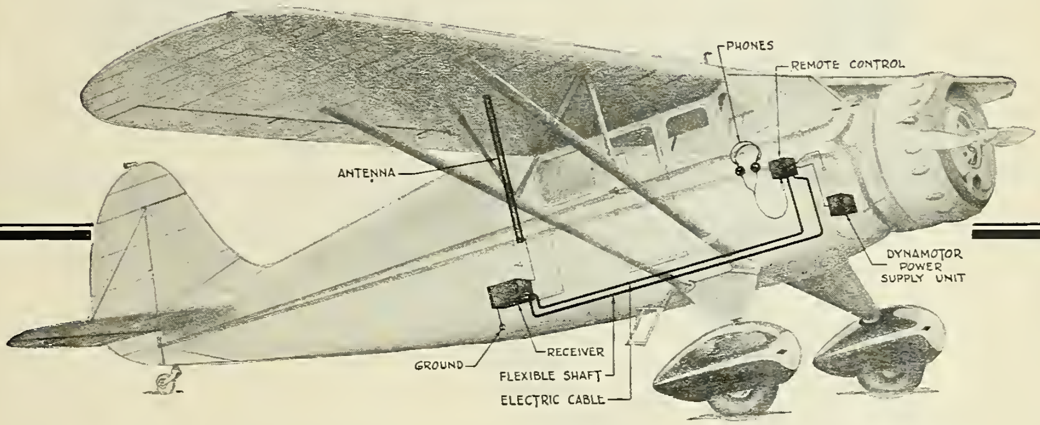

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RCA VICTOR

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Camden, N. J. *"Radio Headquarters"*

Aero Digest, *April*, 1934
Volume 24. *Number* 4.
Published monthly by Aeronautical Digest Publishing Corp., at 515 Madison Ave., New York, N. Y. Yearly subscription, $3. Entered as second class matter July 17, 1922, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

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· TACHOMETERS · MANIFOLD PRESSURE GAGES · FUEL QUANTITY GAGE · AIR SPEED INDICATORS ·

The precision of the Kollsman Sensitive Altimeter was demonstrated the first time in Major James Doolittle's "blind flight" experiments in September, 1929. Its dependability under the most adverse conditions was proved in Wiley Post's "around-the-world flight." In thousands of planes it is an indispensable factor of safety.

Recognizing the importance of such an instrument, the U. S. Air Services have adopted the Sensitive Altimeter as standard equipment, and the Department of Commerce requires its use on every Air Line passenger plane. Consequently, the Kollsman Sensitive Altimeter is in service on the airplanes of 25 air transport companies and it is found on the instrument panels of practically all U. S. Army and Navy planes. Foreign Governments as well as private pilots the world over are becoming increasingly aware of the outstanding qualities of this unique instrument.

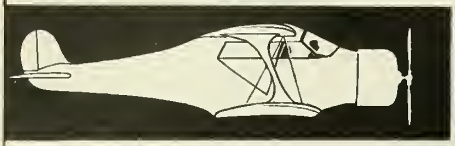
It reads like a clock—the large pointer in hundreds and the small pointer in thousands. It is adjustable by a barometric pressure scale, or by markers along the altitude scale; available in ranges of 20,000 ft., 35,000 ft., and 10,000 meters; also to order in ranges of 50,000 ft. and 16,000 meters; barometric pressure scale graduated in inches or millimeters of mercury, or in millibars. Standard mounting. It combines the functions of four instruments—high range altimeter, landing altimeter, level flight indicator, climb and descent indicator. *Write for the Kollsman Catalog.*

KOLLSMAN INSTRUMENT COMPANY
5 JUNIUS STREET, BROOKLYN, NEW YORK

KOLLSMAN

PRECISION AIRCRAFT INSTRUMENTS

It's Hard to Believe—
but these are the



FACTS

The
BEECH AIRCRAFT COMPANY
WICHITA, KANSAS

ESTIMATES made on the New 225 h.p. Beechcraft, prior to actual flight, were based on the performance of the 420 h.p. Beechcraft. We estimated that this New Beechcraft would have a top speed of 170 m.p.h.

The flight tests have now been made. The speed of the ship has been clocked. We are ready now to give you the actual facts. *These facts are guaranteed within 2%* under standard atmospheric conditions.

In every respect the performance exceeds our estimates. The top speed of this New 225 h.p. Beechcraft is *175 m.p.h. with a cruising speed of 152 m.p.h.* We invite you to compare this guaranteed performance with the *guaranteed top speed* of any other four-place, 225 to 260 horsepower airplane.

But in spite of its high speed the New Beechraft can be landed easily and at a slow speed. *It has a landing speed of 45 m.p.h.* This is a ratio of approximately four to one.

We realize these statements are hard to believe—they were hard for us to believe—but after making repeated performance tests *we know they are correct.*

Specifications, descriptions, illustrations, and other performance facts concerning this New Beechcraft are included in our catalog. *Write for it.*

Walter H. Beech

The BEECH AIRCRAFT COMPANY » » » Wichita, Kansas

PARKS

6 YEARS OF LEADERSHIP

Founded six years ago, when "flying schools" consisted of a ship or two on any empty field, Parks Air College had the resources, the capital and the personnel to overnight spring into international leadership.

For six years Parks aviation training has been recognized as the finest available. Parks graduates have been called the finest material coming into the industry. Parks Air College has been building men for success. The Parks system has been outstandingly successful.

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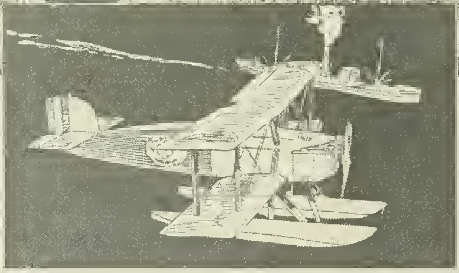
PARKS AIR COLLEGE

WORLD'S LARGEST COMMERCIAL FLYING SCHOOL

SECTION 4-AD, PARKS AIRPORT, EAST ST. LOUIS, ILL.

Round the World Anniversary

TEN YEARS OF DOUGLAS PROGRESS



TEN years after those pioneering Douglas planes established their premature record of being the first to fly around the world, Douglas has introduced its new Transport. ¶ And here again Douglas has pioneered an entirely new standard of air transport luxury and speed. ¶ The three Douglas planes in 1924 averaged 90 m.p.h., for their flying time around the world—a remarkable record then. But on the night of February 18, last, the Douglas Transport averaged 211 m.p.h. for the 2609 miles from Los Angeles to New York, while its passengers relaxed in the luxurious comfort of its soundproofed salon. ¶ Ten years, and more, of engineering progress are behind this new luxurious master of the airways. ¶ Douglas is naturally proud of what has been accomplished, but only insofar as each succeeding advancement forms a stepping stone to even greater progress. Douglas Aircraft Company Inc., Santa Monica, California, U. S. A.

DOUGLAS TRANSPORT

EXTRA *The* KENDALL REFINING COMPANY NEWS EXTRA

BRADFORD, PA. APRIL, 1934

PAN AMERICAN AIR RACES ANOTHER PROOF OF KENDALL'S EXECLLENCE

79.25% of all Winning Planes Lubricated by Kendall Oil

"JIMMY" WEDELL

PILOTS LIKE KENDALL

Kendall Motor Oils are popular with aviators everywhere — they realize that they can be depended upon to give the most satisfactory and economical results under the most severe operating conditions.

Kendall Oils are made from Bradford Grade of Pennsylvania Crude (the costliest in the world) and refined by special processes to a high degree of excellence, and are available at leading airports throughout the country in refinery-sealed cans.

LIGHT PLANE RECORD

S. J. Wittman, using Kendall Oil in his motor, also established a new record for planes under 400 pounds by averaging 137.513 miles per hour over the 100 kilometer course. The previous record was established in 1930 at 101.24 miles per hour.

J. R. WEDELL SHATTERS WORLD MARK

At the Pan American Air Races, held in New Orleans from February 14th to 19th inclusive, Kendall Oil once again presented convincing proof that it will give top-notch, dependable motor lubrication under the most rigid tests. 79.25% of all winners in these races sped to victory with Kendall, The 30 Hour Oil, in the motors of their planes — an impressive record indeed. In air races such as these, unusual stress is necessarily laid upon the lubricant used, because of the high speeds and high engine temperatures resulting, and therefore, the performance of Kendall Oil was even more extraordinary.

100 Kilometer Record Smashed

A feature of the races was the setting of a new world record for the 100 kilometer course by Pilot J. R. Wedell, famous speedster. In the 100 kilometer event, Wedell attained an average speed of 266.0322 miles per hour, beating a record that has stood unchallenged since 1925. The motor of the plane in which Pilot Wedell accomplished this important achievement was lubricated by Kendall Oil.

A list of winners of each event contains the names of famous pilots whose records during the past several years have made aviation history.

The motors of all winners of first place were lubricated with Kendall Motor Oil.

HONOR ROLL

2/14	375 Cu. In.	Art Chester	1st
	550 " "	Harold Newman	1st
2/15	Unlimited	J. R. Wedell	1st
	375 Cu. In.	Lee Miles	1st
	550 " "	Harold Newman	1st
2/16	375 Cu. In.	Lee Miles	1st
	1000 " "	J. R. Wedell	1st
2/17	375 Cu. In.	Lee Miles	1st
	200 " "	S. J. Wittman	1st
	550 " "	Gordon Israel	1st
2/18	550 Cu. In.	Gordon Israel	1st
2/19	Unlimited	J. R. Wedell	1st

KENDALL
THE 30 HOUR OIL

MERELY MAINTAIN THE PROPER OIL LEVEL

NICHOLAS-BEAZLEY

THROUGH THE YEARS...THE MARK OF CONTINUED DEPENDABLE SERVICE ON HIGHEST QUALITY AIRCRAFT PRODUCTS...AT LOWEST POSSIBLE PRICES

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OPERATOR . . MANUFACTURER

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TYPE BA BALL BANK INDICATOR—
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THE JACOBS 225

JACOBS AIRCRAFT ENGINE COMPANY
POTTSTOWN, PA.

All Weather Aviation Mobilgas in the Tank... "Adsorb" Mobiloil Aero in the Engine

SURE SHE'S OKAY. Okay to take the air without cough or spit. Okay to skim the ceiling, ride a storm, cross a mountain range, span a desert. Because she's gassed up right. Oiled up with the best there is.

Aviation Mobilgas—the modern aviation gasoline with "Climatic Control"—keeps the motor purring at its best. Blow hot or cold, wet or dry, heavy ground air or high-altitude light!

In the engine—Mobiloil Aero—with the improved "*Adsorb* Property." It clings to cylinder walls, actually permeating the minute pores of the metal. To maintain a permanent lubrication film even after the engine stops. Which means less starting up wear. More hours between overhauls.

Take on a trial filling of both Mobilgas and Mobiloil Aero. Try out Mobilgrease on your rocker arms too. And Mobiloil Aircraft Instrument Oil and Gargoyle Compass Fluid. See what a difference they make.

Mobiloil & Mobilgas
SOCONY-VACUUM CORPORATION

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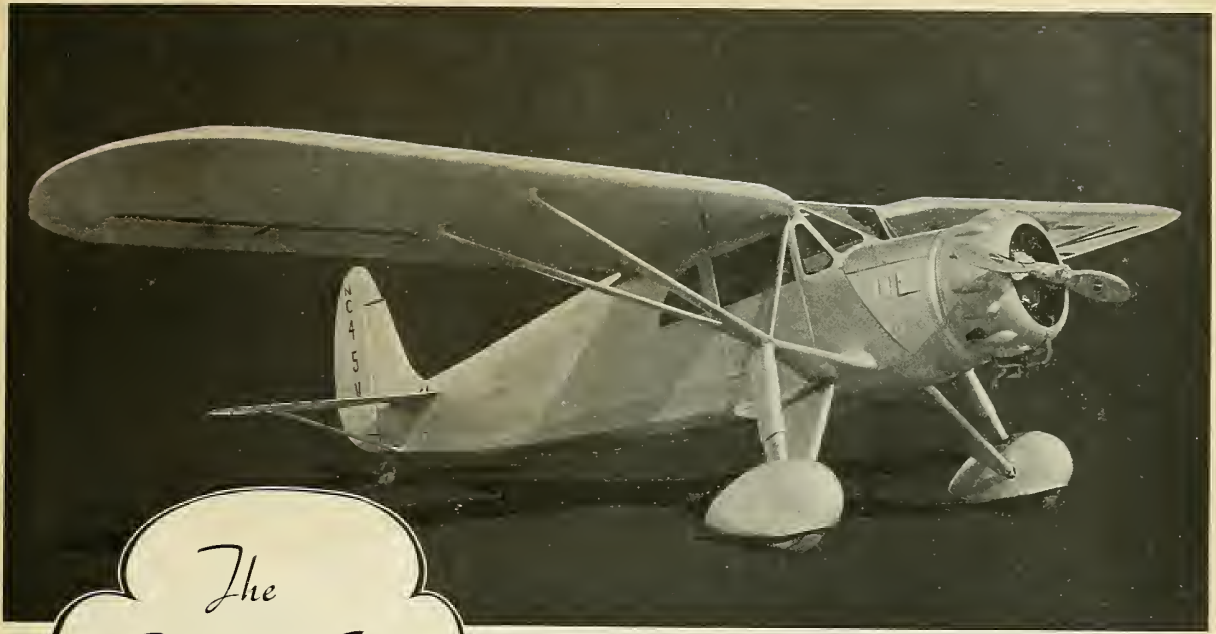

The Fairchild Cabin

Powered by WARNER 145

✓ ✓ ✓ ✓ You asked for it!

THE average two-place cabin job is too cramped and crowded . . . a four-place ship is expensive and costs a lot to operate . . . the new Fairchild "24" is the intermediate step between the two.

Many years of brilliant pioneering have enabled Fairchild engineers to create a ship that *combines* the economy and speed of the small racing type two-seater with the size and roominess and weight-carrying ability so essential for private-owner operation. Here is a plane that carries three people in motor-car comfort . . . and yet is so arranged that two can take enough luggage, golf-bags, guns and fishing tackle for a month's vacation . . . and still ride in companionable, spring cushioned ease—side-by-side.

Read this carefully

The most amazing feature, however, is the efficiency which cruises three people at better than two-miles-per-minute on not more than 8½ gallons of fuel per hour. Imagine—from New York to Washington, 220 miles—in one hour and forty-five minutes—for less than $5.00 . . . or two cents per mile! *Compare this with any cabin ship of similar capacity.* In a year's time, the average owner will fly from 300 to 500 hours if he takes full advantage of a cabin-plane's transportation possibilities. In 500 hours the new Fairchild can actually be cruised as far or farther than its popular 4-place rivals at less than 2/3 the fuel cost required by a 210-225 H.P. engine. In 500 hours, this means a saving of about $625.00 . . . or nearly $2,000.00 during the normal life of the ship. Such facts certainly deserve some concentrated pondering on your part.

Unique Perfections

But speed, economy and space . . . desirable as they are . . . were not the only objectives in this remarkable ship. Befitting a plane so modern and advanced, such singular features as grease-sealed ball bearings on ailerons, elevator, rudder and entire control system; aluminumized oxide on the sand-blasted fuselage, and cadmium-plated or baked enameled fittings, have been incorporated. And, of course, shatter-proof windshield, parking brake, specially designed instrument panel, windshield-wiper, sun-shades, dual controls . . . as well as full N.A.C.A. cowl, streamlines for wheels, landing gear and struts are part of the Fairchild idea of super-quality, luxury and excellence which distinguish this plane.

It is needless to detail the flying characteristics . . . as the same features which have made Fairchild planes a standard for stability, maneuverability and strength are more pronounced than ever. Mere description cannot convey the true superiority of this ship . . . you must see it and fly in it . . . that alone can give you the story.

Facts and Figures

TOP SPEED . . . 145 *M.P.H.—or exactly one-mile-per-hour-per-horse-power!*

CRUISING SPEED . . . 126 *M.P.H.—a* 500-*mile trip in four hours.*

LANDING SPEED . . . *between* 40 *and* 45 *in still air, depending on the load.*

RATE OF CLIMB . . . 750 *ft. per min. fully loaded—or* 2,000 *ft. in* 2¾ *min.*

WEIGHT CAPACITY . . . *over* 800 *lbs. useful load—in addition to starter and battery.*

FOR TWO . . . *over* 200 *lbs. baggage—which can be put into "rumble seat" space.*

FOR THREE . . . *from* 25 *to* 75 *lbs. baggage—depending on starter, propeller, etc.*

COST OF FUEL . . . $2.75 *per hour—figuring gas at* 30*c. and oil at* 40*c.*

CRUISING RANGE . . . 600 *miles—from New York to Cincinnati or Chicago to Atlanta in one jump.*

We will gladly arrange a demonstration, or send additional literature for the asking.

FA

Fairchild Airplane
Sales Corp.
WOODSIDE, LONG ISLAND, NEW YORK

Some of the planes – at RY

MODERN FLIGHT AND SHOP EQUIPMENT, as well as modern buildings, are maintained for students at the Ryan School of Aeronautics. Late type planes give Ryan students an exceptional diversity of experience. In the completely equipped Ryan shops, technical training brings daily contact with the actual construction, maintenance and overhaul of late type planes and motors.

SYSTEMATIC SCHEDULES guide the entire day. Ryan students never "go stale" with delays, for the entire training period is devoted to aeronautical activities . . . . at this $2,000,000 airport . . . . in extensive cross-country flights . . . . or, in close contact with the many government and commercial airplane shops in San Diego.

SAN DIEGO, CALIFORNIA, the home of the Ryan school, is internationally famous as an aeronautical center. Favored by clear skies and year 'round moderate temperatures, Ryan students enjoy uninterrupted flight schedules. And the varied California terrain allows exceptionally valuable cross-country flying experience over mountains, desert and ocean shore.

A TRAINED CORPS OF INSTRUCTORS, under the personal direction of T. Claude Ryan, original designer and builder of Ryan airplanes, guide students through every detail of their courses. These men know the needs of the aeronautical industry, and understand and are interested in individual student problems.

STUDENTS COME TO RYAN FROM EVERY STATE in the Union and from foreign countries as well. Present new Ryan tuition rates, the lowest in the history of the school, now make it possible for you also to come to San Diego and enjoy this superior instruction, with ultra-modern equipment, under ideal conditions—at no extra cost.

THIS IS AMERICA'S MOST PROGRESSIVE AVIATION SCHOOL

◆

KEY TO PICTURES

(1) Great Lakes plane from Ryan School—over San Diego.
(2) Ryan students enjoy amphibian training on San Diego Bay.
(3) Motor instruction in Ryan Shops.
(4) A wide variety of planes in the spacious Ryan hangar.

◆

shops and equipment you will use-

AN

5

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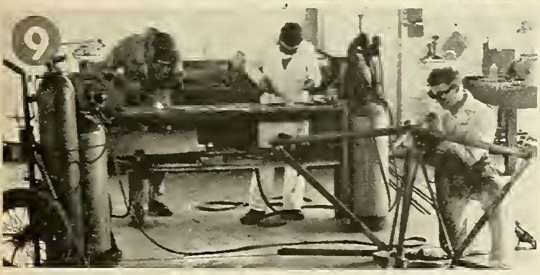

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KEY TO PICTURES

- (5) Ryan classroom scene, Feb. 16, 1934.
- (6) Night flying by Ryan students—from Lindbergh Field.
- (7) Ryan Brougham—one of the cabin planes used for student instruction.
- (8) Ryan shops give extensive practical experience.
- (9) Aircraft welding is a part of Ryan shop training.

◆

A FREE TRIP TO CALIFORNIA!

Subject to withdrawal without notice, Ryan now offers with Transport Courses a refund of full first class railroad fare to San Diego. One-half the transportation cost will be refunded with Limited Commercial or Private Courses. Write for details of this special offer.

Ryan School of Aeronautics,
Lindbergh Field, San Diego, Calif.

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( ) Private Pilot's Flying Course	585
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( ) Ryan deluxe Combination Transport Training plus new Great Lakes Airplane	3555
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Weems Navigation Courses:	
( ) Residence Course at Ryan	150
( ) Correspondence Course	100

Name.. Age....................

Address.. City.............................. State....................

U.S. DEPT. OF COMMERCE Approved HIGHEST TRANSPORT RATING

RYAN SCHOOL OF AERONAUTICS

Lindbergh Field

In Sunny SAN DIEGO, CALIFORNIA

DALLAS AVIATION SCHOOL AND AIR COLLEGE, DALLAS, TEXAS

The Nation's Best Equipped Aviation School

Put This Extra Money In Your Pocket!

Our NRA Coupons Mean MORE Savings

COUNT UP THE SAVINGS!

NOT ONLY do our regular rates mean big SAVINGS to you, but think of the EXTRA savings we offer you—the NRA coupon, the free railroad fare offer—and on top of all these, living expenses at Love Field are unusually low. If you count the cost—you will come to Dallas!

New Additions to Our School Plant

Growing needs of our school have forced us this month to add a new dormitory for students, and another hangar. Our purchase of the latter brings our total to four hangars, and the new dormitory almost doubles our students' living quarters.

AVIATION MARCHES ON!

We have more confidence in the future of commercial aviation than ever before and are expanding our school accordingly. Our aim is to make this school world-famous as a flying center and we are leaving nothing undone to that end. Nature has given us ideal flying weather the year 'round—the United States Army spent millions to make Love Field a great flying field—commercial aviation during the last few years has made it a great airport.

And Now—Our Greatest Enrollment

And now we are proud to announce the greatest enrollment at DAS in years, with new students enrolling every week from all over the United States, besides several foreign countries.

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Transport Pilots Course	$1,795
Less NRA coupon saving	150
Limited Commercial Pilots Course	595
Less NRA coupon saving	75
Private Pilots Course	545
Less NRA coupon saving	50
Amateur Pilots Course	350
Less NRA coupon saving	25
Combined Limited Commercial and Master Mechanics Course	795
Less NRA coupon saving	100
Combined Private Pilots and Master Mechanics Course	745
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Combined Amateur Pilot and Master Mechanics Course	650
Less NRA coupon saving	50
Combined Solo Pilot and Master Mechanics Course	495
Less NRA coupon saving	50
Master Mechanics Course	300
Less NRA coupon saving	25

Each enrolling student is given the advantage of the NRA coupon. It saves from $25 to $150 on our courses.

Facts About D. A. S.

- Prices are lower.
- Dormitories and cafe.
- All year school.
- All conveniences.
- Par excellent shops.
- Three class rooms.
- Radio school.
- Four large hangars.
- Love Field—268 acres.
- Dallas, 300,000 population.
- No flying hazards.
- Safe and sane methods.
- Commercial aviation only.
- 7-years successful operation.

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A new and fully equipped Fledgling is the latest addition to our list of ships. It is for radio beam, blind flying and night instruction. Our other ships include:

- Trimotored Ford
- 7-place Travel Air cabin, Wasp motor
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- 3-place Stearman open
- 3-place Rearwin open
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- 2-place Fledgling
- 2-place Fleets, 5 of them

In all America you will not find a line-up to compare with ours, and you will enjoy your sojourn with us.

The place to learn aviation is where aviation is at its best. Dallas is the place.

Some part-time work is available for every student if he wants it, in addition to the NRA coupon. We help our students every way we can.

FREE! One-half the cost of a railroad ticket to Dallas with every course—FULL railroad fare with the Transport Course.

WRITE for our 1934 catalog and NRA coupon. Use this coupon.

Dallas Aviation School and Air College
Love Field, Dallas, Texas

Gentlemen: Send information on the courses checked:

Transport Pilot ☐	Master Pilot ☐
Limited Commercial ☐	Master Mechanic ☐
Private Pilot ☐	Aviation Radio ☐
Solo Pilot ☐	Complete Radio ☐

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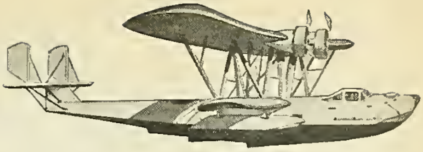
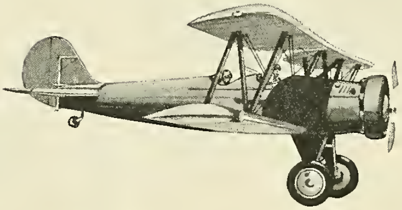
LOVE FIELD • DALLAS, TEXAS



LONG-RANGE NAVAL PATROL FLYING BOAT MODEL P2Y-2



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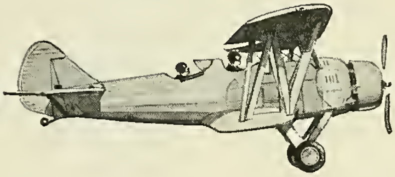
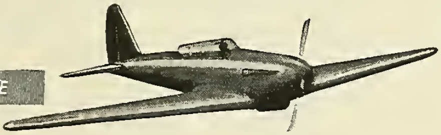
TWO-SEAT MILITARY PURSUIT AIRPLANE



NAVAL BOMBING AIRPLANE



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Supremacy in the Air

Consolidated Aircraft Corporation has served the U. S. Army Air Corps and the U. S. Naval Air Service, in the design and development of its five latest types presented here . . . . five formidable weapons of national defense, each embodying important new discoveries in aerodynamics, in construction and in military efficiency.

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take off WITH ADDED SAFETY

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Texaco Airplane Oils bring that comforting assurance that oil lines are clear and that every part of your motor is receiving the effective lubrication upon which its life and your safety depend.

Use Texaco Airplane Oils and enjoy freedom from care, true economy and longer engine life. Texaco Aviation Products are available at principal airports throughout the United States.

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135 East 42nd Street, New York City

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TEXACO AIRPLANE OILS ★ TEXACO MARFAK GREASES
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NRA

AERO DIGEST

VOLUME TWENTY-FOUR NUMBER FOUR

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The new Lockheed Electra 12-place transport, powered by two P & W Wasp Junior engines supercharged to 420 horsepower each

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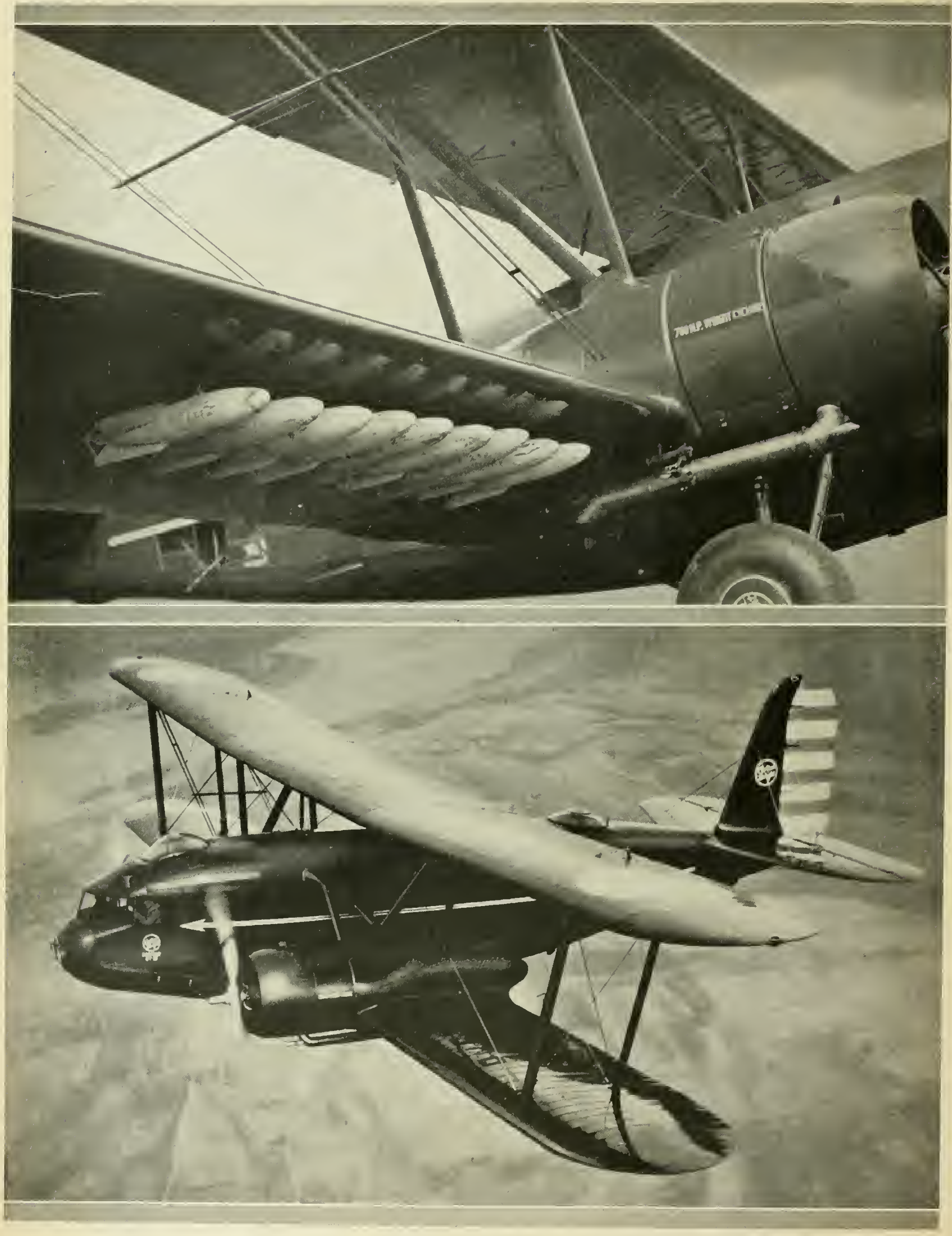
AERO DIGEST BUREAU: 14th and F Sts., Washington, D. C., Phone National 2299.



The Curtiss-Wright Condor Bomber BT-32, which has a speed of 175 miles per hour, is one of the largest and fastest bombers in the world. It is capable of carrying 2200 pounds of bombs.

AIR
Hot and Otherwise

●

FRANK A. TICHENOR

• Now that our air mail system—which incidentally was the best in the world—has been wrecked by the blunders of those in Washington who took charge of our Federal affairs last March, it looks as if it must be started from scratch and built up again. Since 1927 Aero Digest has advocated "all first class mail by air." So while rebuilding, let us have this objective in mind—*"All first class long haul mail by air."*

This country is entitled to faster and better mail service. The people now pay for something they do not get—transportation of today's letters for delivery at destinations tomorrow morning, or the second day at latest.

Over-Night Mail Service

Important east and west coast and southern cities should be only over-night from mid-western centers, and east and west coast cities should not be over one full day apart so far as letter transmission is concerned.

The post office department makes millions of dollars yearly in the handling of long haul first class mail, and the profits from this source are used by the department to off-set part of the losses of the other classes of mail. The department still uses the railroads for the transportation of first class mail, which only totals about nine per cent of all the various classes of mail handled. For the present, at least, the railroads are satisfactory for handling second, third and fourth class mail and, in some cases, short haul first class mail.

Records show that during one year 354,638,697 pounds of non-local first class mail were carried for an average distance of 521 miles for each pound, with an average revenue to the government of 2.125 cents per piece, with an average weight per piece of less than one-half ounce. At that time the first class postage rate was two cents for each ounce, or part thereof. The revenue received by the government for the handling of over 354,000,000 pounds of first class mail was $258,000,608, and the actual cost to the government (including all charges for transportation, handling, etc.) was $210,301,720. The profit to the government for handling non-local first class mail in that year was $47,698,888. In addition to the above the revenue from air mail was $4,250,546. Air mail cost was $11,169,015. During that year the government lost $6,918,468 on air mail. During the same period the government made a profit in the handling of local delivery letters which amounted to $37,852,998. The total profit to the government from the handling of first class mail during that year was $78,633,418. However, when the profit and loss account for the year was totaled, the actual loss for the combined operations of the post office department was $87,985,841.

The 354,000,000 pounds of non-local first class mail was carried 184,897,753,392 pound-miles. If this first class mail had been carried by air it would have required 486 planes carrying an average load of 2,000 pounds, for a distance of 521 miles per trip, for each of the 365 days in the year. The airlines could well afford to carry mail in capacity loads for 1/3 mill per pound mile. At this rate the cost to the government for approximately 184 billion pound-miles would have been $61,630,000. This is about $32,000,000 more than it actually did cost the government. At the present time the government receives 3 cents an ounce for handling non-local first class mail, an increase of 50% over the former rate; consequently the profit to the government in the handling of non-local mail would have been approximately $100,000,000. A handsome profit for Uncle Sam!

Profit for the Airlines

So far as the airlines are concerned they would have made a profit in excess of $20,000,000 for furnishing this transportation service. At the same time air lines would have been extended, new types of airplanes designed for use over particular routes would have been developed, more frequent passenger service would have been available and aviation would have advanced far beyond present day standards.

To handle 177,000 tons of first class mail by airplane (approximately 184 billion pound-miles) during one year would require the services of over 1,200 transport pilots who would receive about $7,000,000 annually in salary and a trained personnel for ground operations of at least 7,000 other employees. Not less than 1,500 airplanes of different types with pay loads varying from 500 pounds to 3,500 pounds would have been required to furnish the service. Airplanes designed for particular routes (like New York-Chicago, or St. Louis-Cleveland) would be considerably different from those required on longer routes (like San Francisco-Chicago, or Kansas City-New York) where speed as well as capacity would be prime requisites.

Passenger Service Improvement

Passenger service over the entire country would be greatly improved, for with airplanes carrying capacity loads of mail and passengers combined, more frequent service would result. There would be hourly service between many of the large cities, and in addition large mail planes carrying the over-night mail between such centers. Every town of 20,000, and over, throughout the country would be benefited by such service, for feeder lines owned by independent operators would furnish adequate passenger and mail service to each.

It might be advisable to furnish "special" air mail service, meaning that a letter would travel by the *fastest* airplane available at a cost slightly higher than the regular mail rate.

How much longer must the present stupid mail policy be continued? The people are rightfully entitled to the fastest service which can be furnished, and there is no valid reason why all non-local first class mail should be handled in any other way than by airplane. Aviation has developed to the point where this is practical and a necessity so far as the users of regular mail service are concerned. Now the airlines of the country have the most efficient equipment, adequate facilities, and trained personnel necessary to furnish practically uninterrupted service. Therefore the fastest transportation service is available for first class mail which is travelling along the ground in carriers but little faster now than they were twenty years ago.

Aviation Development in Soviet Russia

J. Unshlikht, chairman
Civil Aviation Fleet

In this presentation, the non-military portion of which was compiled with the cooperation of the Amtorg Trading Company, will be found the accomplishments of U.S.S.R. during the First Five-Year Plan and its aims during the Second Five-Year Plan. All photographs used are from the Soviet Photo Agency, American distributor for Soyuzphoto, central photo agency of the U.S.S.R.

R. P. Eidemann, chairman
Civil Aviation Society

● Recognition of the Union of Soviet Socialist Republics by the United States has thrown open to American industry vast trade possibilities which were unavailable for more than sixteen years.

Russia has been, and still is, in need of almost unlimited supplies of machinery, automotive equipment, etc., and how much of this will be filled by American manufacturers will depend in a great measure on the adoption of suitable credit arrangements and the promulgation of reciprocal trade agreements. Only recently direct aid from the U. S. Government along these lines became available by the creation of the Export-Import Bank of Washington which was organized (in part, at least) to extend credit to encourage Russian trade.

Russia conducts its national affairs according to plans usually made for a period of five years and known as the Five-Year Plans, the first of which has been successfully terminated while the second is now in its initial stages.

Naturally, high Russian officials have a keen appreciation of the possibilities of aviation. Handicapped by lack of adequate equipment and engineering designs, the country at first had to rely to a great extent on other nations. But despite these drawbacks, great strides were made in both commercial and military aviation and in aeronautics generally, and eventually Russia was able to turn out aerodynamically sound aircraft and aircraft engines and to organize a nation-wide transport system. Moreover, the Russians have progressed so favorably that they have established a number of world's air records which have not been officially homologated because the country is not yet a member of the Federation Aeronautique Internationale.

Such an auspicious beginning was sufficient to spur the U. S. S. R. to even greater efforts. From the military standpoint, its commissioners realize the futility of a large standing army without an adequate air force. It is sufficient to report that today Russia has an air force which compares favorably with other powers in Europe; both in numbers and in the morale of its personnel.

Also, Russia is taking advantage of the great possibilities in commercial aviation as embraced in transportation, photography, survey, agriculture and education and for the Second Five-Year Plan a civil aviation program has been adopted which, when completed, will result in a most exhaustive and comprehensive use of the airplane for non-military purposes.

To accomplish this widespread program which ends in 1937, Russia undoubtedly will need outside aid. What part Ameri-

A show of aerial strength. Soviet army planes assembled on the field in Moscow can pilots, engineers and products will play in the successful termination of this second plan, can only be conjectured. This much, however, is fairly certain. Russia will make extensive use of American aeronautical products.

Air Transportation

Air transportation in Russia dates back to 1922 when a joint stock company called Deruluft was established by the Soviets and Germans to link Moscow with Berlin and other European capitals. The following year the U. S. S. R. began building up its own airline system which in the ensuing decade made tremendous progress in the amount of traffic carried and in the routes and mileage covered.

Travel by air takes on a particular significance in a country as large and widely separated as Russia. In many instances, and particularly in Central Asia, Kazakstan, Eastern Siberia and the Far East, the airplane cannot be replaced by any other form of transport.

From a meager beginning of 7,110 miles, the length of lines by the middle of August, 1933, reached 31,815 miles. Service has been placed on a year-round basis and the main routes traverse the most remote places with spur lines leading off to most inaccessible points in the country. The main routes have been chosen for particular political and industrial reasons and a review of the accompanying map will show why U. S. S. R. ranks among the leaders in this branch of aviation service.

The network of airlines, in addition to the Moscow-Riga and Leningrad-Riga lines, which constitute sections of the Deruluft international lines, embrace such important trunk lines as: Minsk-Moscow-Sverdlovsk-Novosibirsk-Irkutsk-Khabarovsk-Vladivostok (5,497.5 mi.); Leningrad-Moscow-Kharkov-Rostov-Baku-Tiflis (2,243.6 mi.); Moscow-Samara-Orenburg-Aktyubinsk-Tashkent (1,894.6 mi.) and Moscow-Kazan-Ufa-Magnitogorsk-Karaganda-Alma-Ata.

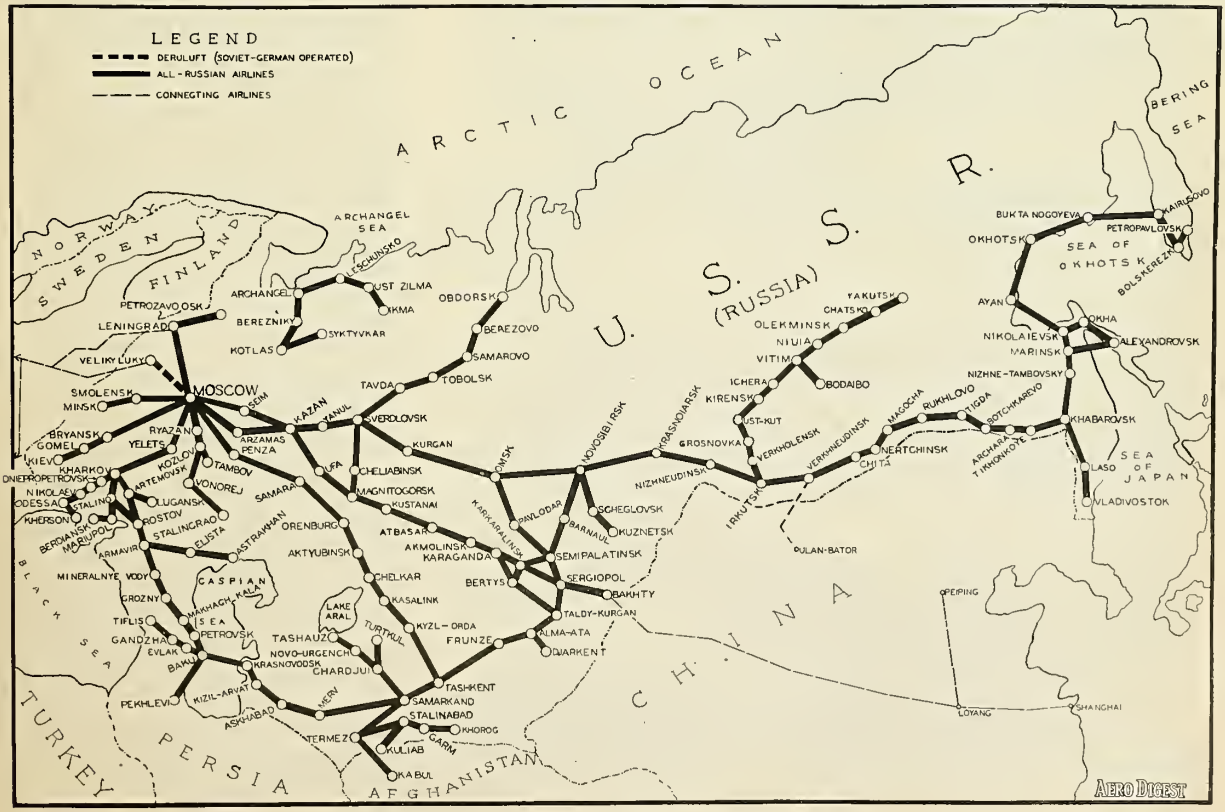
In a country so vast as the Soviet Union, the transport of air mail is most important in keeping the outlying districts in close touch with the center. The rapid growth of this branch of the aerial service is evidenced in the report that during the first few months of last year, 462.3 tons of mail, more than were carried in all of 1932, were flown over regular lines. A comparison by years shows air mail steadily increasing with 116.6 tons carried in 1930; 322.4 tons in 1931 and 454 tons in 1932.

One of the most lucrative forms of aerial work in Europe is the transportation of freight or express and the Soviet Union has made this business one of its most important economic tasks, carrying at the end of the First Five-Year Plan 215.8 tons of merchandise. Valuable furs are transported from the trapping regions to the center of the country, and according to the All-Union Fur Company (Soyuzpushnina), several tens of thousands of skins were carried by air during last spring and summer from the shores of the Ob, Yenisei and Lena rivers.

Passenger transportation has also shown surprisingly good results even in the more developed sections of the country where rail and motor transport is available. While only 2,923 passengers flew in 1923, this figure grew to 17,800 in 1930 and 31,600 in 1932, with every indication that this year will see further substantial increases.

Non-Transport Activities

It is in its agricultural and forestry endeavors in the air that the Soviet Union leads the world. After a modest beginning in fighting crop and animal pests from the air over an area of some 5,000 acres in 1925, this method developed to the point where an area of 2,494,700 acres was covered in 1932. This branch of aviation was inaugurated during the First Five-Year Plan and the program outlined was exceeded in three and a half years, allowing the U. S. S. R.



Map showing routes of airlines in Russia and their connections

Civil aircraft of Russian manufacture. The top view shows high-wing and low-wing monoplanes and an amphibion. In the center is the 450 h.p. Kalinin K-5, while at the bottom is the Wright-powered AIR-5, a four-place cabin monoplane built by Ossaviachim

in 1931 to take first place in this type of aerial work.

In 1932, the airplane was used in patrolling some 24,700,000 acres of forest land in fighting fires; in clearing about 1,059,630 acres of farm and forest land of injurious pests and in sowing 143,260 acres of land. The marked success of aerial sowing led to a considerable expansion of the work in 1933 when almost 555,750 acres were scheduled to be sown before the year was out.

One of the most recent tests made by this fleet has been the fight against the malaria mosquito whose larvae over an area of 1,447,420 acres of water surface were destroyed in 1932, while 2,470,000 acres were scheduled for such work last year.

Much has also been accomplished in the air in connection with various scientific and industrial missions. The work done by Soviet fliers in assisting Arctic expeditions of icebreakers and in aiding in the rescue work of the airship *Italia*, Carl Ben Eielson and Jimmy Mattern, is well known. More than 105,638 miles were covered in such flights in 1932 and additional mileage was accumulated by these pilots in helping hunting and fishing expeditions locate seal herds, fish schools and in guiding boats through the ice.

Manufacture

Non-military aircraft production in the U. S. S. R. comes under the Civil Aircraft Trust, which in turn is attached to the Labor and Defense Council. Under this trust are the aircraft factories which either develop and/or manufacture non-military aircraft.

One of these, however, the Central Aero-Hydrodynamics Institute in Moscow, develops both commercial and military aircraft and comes under the jurisdiction of the War Commissariat. In it, theoretical and experimental problems are studied as well as the design and construction of aircraft under A. N. Toupolev, chief engineer. Among the commercial types developed are the ANT-9, a nine-passenger tri-motor, the ANT-14, a five-engined 36-passenger all-metal monoplane, and the ANT-4, a twin-engined bomber.

Successful production of welded stainless steel planes was achieved by the Scientific Research Institute of the Civil Air Fleet in the Stal-2, Stal-5 and Stal-6, while another factory, a division for the design and construction of light sport and commercial planes, produces the AIR-5, AIR-6 and AIR-7.

Out of Research Institute and from designs by Engineer V. N. Sharov has come the newest amphibion, the SH-5. This ship has varied uses, and with its retractable gear and wing floats can be flown for forestry aviation, in agriculture and for transportation. Equipped with two M-22, 480-horsepower engines, its speed ranges from 136 to 143 miles an hour. The cabin accommodates 14 passengers and its design enables landings on land, water, snow or ice.

The factory operated as Plant C. H. (formerly known as Kalinin, after the scientific engineer of the same name) is responsible for constructing the largest plane ever built, the K-7, which accommodated 128 passengers in addition to the normal crew. Other types turned out by this factory are the K-5, a 10-place cabin monoplane; the K-6, a mail plane, and the K-9, a two-place light plane with folding wings.

Progress has been made in the design and development of amphibions, autogiros, gliders and a tailless plane. In addition, a special trust for dirigible construction was started in 1931 and to date at least nine experimental airships, four non-rigid and five semi-rigid ranging in volume from 75,900 to 240,108 cubic feet, have been designed, built and successfully test flown. A medium-sized semi-rigid type of 653,235 cubic feet capacity is under construction and another of 1,765,500 cubic feet has been designed. Umberto Nobile, former commander of the Italian airship *Italia* is serving as dirigible construction consultant.

Much headway has been made in scientific research work, and among the products developed is a new alloy called Alplata Tsagi. The use of this alloy is said to make it unnecessary to remove the entire silicon content from the aluminum, to lower the cost of production over duralumin and to rust-proof and eliminate painting of aircraft surfaces. Other developments are seen in a new glue for aircraft construction and in a new plumbic bronze. Particular attention also is being given to the development of Diesel aircraft engines and stratosphere planes.

Aims of 1937 Program

At present there are 15 aviation schools in the Soviet Union, where training is given in mechanics, flying, etc. Aviation clubs and glider schools have been organized in many towns and more than 7,000 persons are now engaged in the construction of gliders. In the first five months of 1933, five new schools and 110 glider stations were opened providing a tremendous impetus to the art of powerless flight. The Russians now hold a number of unofficial world's glider records including: altitude, 7,226 ft.; duration with passenger, 10 hours 56 minutes, and altitude with passenger, 6,381.5 ft. At a recent competition in Koktebel, Crimea, a Soviet glider with two passengers flew for 9 hours, while another was towed from Koktebel to Moscow, a distance of 3,007 miles.

Through the organization known as Osoaviakhin (Society of Friends of Aviation) with a membership of six millions, the general populace has contributed funds for the construction of many airplanes, and special interest is being taken in the construction of an eight-engined, 70-passenger airplane (ANT-20) to be named after Maxim Gorky and to be used for cultural propaganda purposes. It will carry printing apparatus, broadcasting equipment and a movie projector.

According to preliminary plans, by the end of 1937 airlines should reach 124,280 miles, 20 per cent of which will be seaplane routes. New research and experimental construction is expected to progress to the point where the maximum speed of transports on regular lines will be about 300 miles an hour with an average cruising speed of 150 miles an hour. All routes are to be equipped with lighting and radio facilities and it is planned to have at least one airport in every large industrial center and a landing field for every large estate and collective farm, with an ultimate aim of 5,000 major airports throughout the entire country.

Airplane sowing by 1937 is expected to cover 7,410,000 acres of ground, 22,230,000 acres of forage grasses and 741,000 acres of forest trees. Aerial surveys in 1932 covered an area of 44,410.5 square miles, while aerial photography has proven specially valuable in cartographic work in connection with the planning of new economic regions. A significant part in a broad and detailed study of the vast natural resources of the country is to be played by aerial photography in the future. To date there are few dependable geographical and topographical maps of the Soviet's territories, and modest estimates for the five years call for photographing no less than 70 per cent of the country's entire area, or 6,177,600 square miles. The finished maps will be used in realizing the plans for amelioration and utilization of the water resources and in an orderly, intelligent exploitation of natural wealth.

The production of aircraft engines has also been organized and power plants up to 700 h.p. are now being built in Soviet factories. Recently a contract was concluded between Glavaviaprom (The United Aviation Industry) and the Curtiss-Wright Corporation providing for the technical assistance of the latter in the design and manufacture of Wright airplane engines in the U. S. S. R.

During the years 1928 and 1931 inclusive, the United States exported to the U. S. S. R. an average of about $345,000 worth of aircraft engines and parts each year, while in the last four months of 1933, more than $167,000 worth of such equipment was purchased from us by Russia. Various commissions of Soviet aviation experts have visited this country from time to time in recent years to study the organization of American airlines and of the aviation industry, and it is to be expected that American products and methods will find greater favor in Russia.

Stratosphere Flights

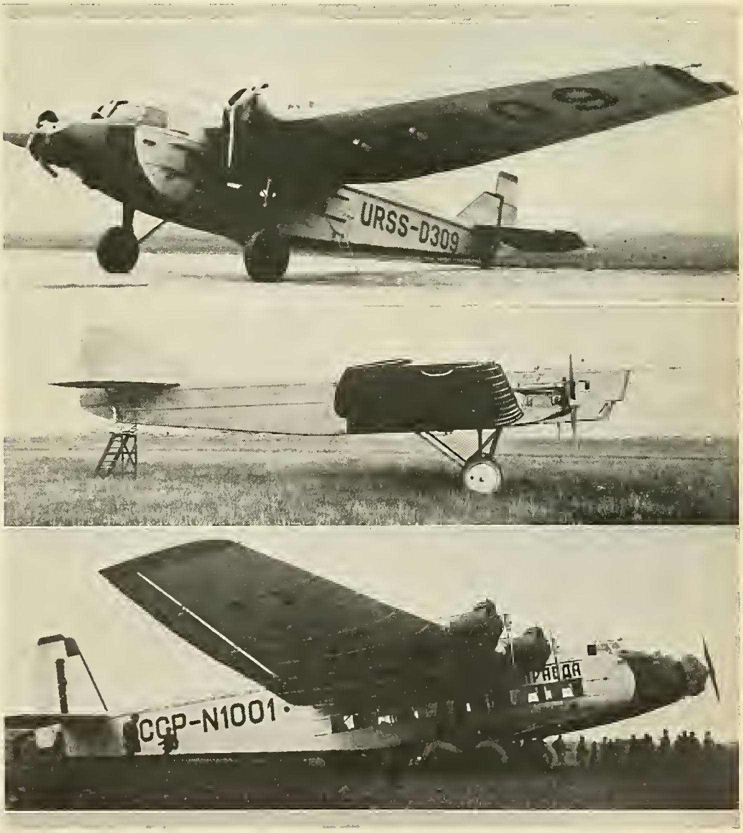
An event of great significance in aviation was the successful flight into the stratosphere by the Soviet Army's stratostat *U. S. S. R.*, which attained an altitude of 60,352 feet as against the previous world's record of 53,152 feet reached by Prof. August Piccard. During the flight of the Soviet designed and manufactured balloon on September 30, 1933, constant radio communication with ground stations was maintained and important scientific information recorded. Only recently another flight was made by a larger Soviet balloon the *Osoaviakhim I*, but after attaining a new altitude record of 72,178 feet and gathering much valuable scientific data, it was destroyed in a crash-landing. Further flights into the stratosphere will, however, continue, and as a result of these, a study to determine the feasibility of super-speed air routes in the higher altitudes will be made.

A summary of the foregoing shows that as a result of its progress from 1923 to 1932, Russia now ranks third in the world in the length of its airlines, second in respect to air mail and first in the use of aircraft in forestry, agricultural and patrol work. During the past few years, the Soviet has spent an average of $80,000,000 a year on the development of its civil air fleet and intends to spend more to successfully complete the terms of its Second Five-Year Plan.

Military Aviation

In keeping with the practice of other countries, little has been released concerning Russia's military plans in the air for the next five years. However, in accordance with the requirements of the First Five-Year Plan, allowance was made for the purchase or construction in the U. S. S. R. of the following types of military aircraft:

80 heavy bombers; 120 long-distance reconnaissance; 80 trainers; 342 all-metal fighters; 112 army cooperation planes; 12 torpedo seaplanes; 63 bomber seaplanes; 242 fighter seaplanes; 86 reconnaissance



Three ships designed by Engineer Toupolev. The tri-motored ANT-9, the twin-engined ANT-4 and the ANT-14 with five engines and accommodations for 36 passengers seaplanes; 18 trainer seaplanes; 6 light escort airships and 16 observation balloons.

Also, early in 1932, the Administration of the Aerial War Fleets drew up a program for the ultimate production of 8,000 planes and 20,000 engines, but based on actual production during 1932, when less than 1,000 planes were produced, little hope is held for completing this production in Russian factories.

The factories engaged in the manufacture of military aircraft are:

Plant 1, Moscow. Produces planes, radiators, wheels, wires, bomb racks and machine gun rings.

Plant 21, Nizhni Novogorod. Equipped to build wood and metal single-engined types of aircraft.

Plant 22, Fili. Formerly Russian branch of Junkers. Builds all-metal military planes of all types and large commercial ships.

Plant 23, Leningrad. Constructs and repairs planes and seaplanes.

Plant 31. Taganrog. Primarily intended for construction of all-metal types and the source of supply for all aircraft for the air forces on the Black and Caspian Sea.

Plant B, Voronej. Now engaged in repair work on bombers, but will eventually produce all-metal aircraft.

The following plants are engaged in the production of aircraft engines:

Plant 24, Moscow. Produces the Avia-Trust M-5 (Liberty) water-cooled and the Mono-Gnome air-cooled types.

Plant 26, Rybinsk. Produces the German B. M. W. water-cooled engine under license.

Plant 29, Zaporozhie. Bristol Jupiter and Hispano-Suiza engines produced under license and overhauls all engines of the South Russian Air Fleet.

Plant M, Perm. Engaged only in repair and overhaul work.

The accessory factories, all located in Moscow, are:

Plant 20. Carbureters, fuel pumps (French A. M. type), gears and armament.

Plant 28. Wood propellers and skis.

Plant 30. Paints and varnishes.

Plant 33. Standardized nuts, bolts, screws and parts.

Although some of these factories are in full production, most of them are working below their prearranged capacity due to lack of complete machinery and tool equipment. Plans have been completed to provide full equipment for those needing it and to expand and enlarge the facilities of the others which are now running at capacity.

The Russian military planes are classified as R—reconnaissance and light bombers; TB—heavy bombers and torpedo carriers; I—single-seat fighters; DI—two-seat fighters; MR—sea reconnaissance; MDR—open-sea reconnaissance; U—trainers; and MU—trainer flying boats.

At present, the types listed herewith together with some specific information, are the only military planes in the Soviet Air Force on which brief data can be released; other types not listed are under design, experimentation and production.

R-3, two-place reconnaissance open sesquiplane. Powered by 450 h.p. Lorraine-Dietrich water-cooled engine. Carries 1 fixed and 2 movable guns, bombs and camera equipment.

R-5, two-place reconnaissance open biplane. Powered by M-17, 650 h.p. water-cooled engine. Carries 2 fixed and 2 movable guns and light bombing equipment.

TB-1, twin-engined bomber or torpedo carrier for crew of six, with M-17 engines. Observer gunner located in nose with bombing station below. Accommodations for 2 pilots and 2 rear-gunners with 2 guns.

TB-2, twin-engined heavy bomber with M-17 engines. Carries crew of three.

I-2bis, a single-seater fighter biplane with M-17 engine; equipped with 2 fixed machine guns.

I-3, single-seater fighter biplane with M-17 engine; equipped with 2 fixed machine guns.

I-4, single-seater fighter sesquiplane with 480-560 h.p. radial air-cooled M-22 engine; equipped with 2 fixed machine guns.

I-6, single-seater fighter biplane with 525-625 h.p., radial air-cooled, M-15 engine; equipped with 2 fixed machine guns.

DI-2, two-seater fighter biplane with M-17 engine; equipped with 1 fixed and 2 movable machine guns.

DI-3, two-seater fighter biplane with M-17 engine; equipped with 2 fixed and 2 movable machine guns.

MR-1, reconnaissance flying boat (Savoia-Marchetti S-62 type). Carries crew of 4 and 4 fixed machine guns. Powered by 650 h.p., M-16 water-cooled engine.

MDR-1, twin-engined open sea reconnaissance flying boat sesquiplane with M-17 engines.

MDR-2, twin-engined long-distance reconnaissance flying boat with M-17 engines.

U-2, two-place open biplane trainer with 100 h.p., M-11 radial air-cooled engine.

MU-2, two-place training biplane flying boat built under Savoia-Marchetti license. Powered by M-11 engine.

Russia controls the production of military aircraft through the War Aircraft Trust which is directly under the War Commissariat and is not connected in any way to the Civil Aircraft Trust. However, it is the consensus of opinion that in the near future both trusts and the military and civil air fleets will be combined into a single unit under an Air Ministry.

The War Aircraft Trust supervises factories specializing in aircraft, engine and accessory production and in repair and design, and experimental work. Each plant was given a production figure to which it must adhere and, according to the Second Five-Year Plan, the six aircraft and four aircraft engine plants were to be ready to supply the army air fleet with 20,000 engines and 8,000 planes, 3,000 of which were to be multi-engined bombers.

Prime Minister Ramsey MacDonald of England recently stated in the House of Commons that the U. S. S. R. ranks second only to France in the strength of its military air service and added that the Soviet force had 1,400 first-line planes. Although the total strength of the Russian air force is not known, it is understood that the Soviet hopes to attain first rank in the near future. This means that it must equip its military service with more than 3,000 planes of the first and reserve categories, a most ambitious and industrious program calling for concentrated and intensive activity in all aeronautical factories in the country.

Soviet military ships equipped with skis for winter maneuvers

EDITORIALS

"We wish to thank your President Roosevelt and the people of the United States, not only for the recognition of Soviet Russia, but for your aid at this time. We hope to see Alaska as a great 'bridge' in the future, between our two nations."—PROF. GEORGE YUSHAKOFF, head of the expedition seeking to rescue 89 Russians marooned on the Arctic ice pack.

Opportunity For Air Express

● Air express is faced with a golden opportunity, the chance that proverbially speaking, comes once in a lifetime. With the cancellation of the mail contracts, and with airline operators compelled to turn to other sources to derive the much-needed revenue for the continuation of their systems, the transportation of this type of matter should be the means by which our airline companies will exist until such time as the government returns the mail to the private operators, where it properly belongs.

Vigorous efforts now being made to increase such shipments will undoubtedly result in greater volume, and when the private operators again fly the mails, air express will have established itself as an adjunct which is just as important and profitable as any other form of revenue for the airline company. A program calling for extensive direct solicitation is bringing exceptionally gratifying returns to one of the major airline operators. Similar efforts by all operators will result in increased express poundage for all.

Disruption of the Air Mail Service

● The Chamber of Commerce of the United States emphasizes belief in the contract method for transportation of air mail, the importance of avoiding such disruptions of air transportation as those to which the public is being subjected and the need for prompt restoration of normal service.

The Chamber's membership by repeated declarations, and by a constantly increasing use of air mail, passenger and express services, have clearly shown the value of these services to them and their approval of the contract system under which this country has developed the finest air transport system in the world.

In the main, transportation of air mail should be handled in the same airplanes which carry passengers and express. Otherwise there would be unnecessary duplication of service, increased cost and postponement farther into the future of the time when air transportation will become self-supporting. For these reasons, the existing law was designed to permit air mail, passenger and express services to be provided by the same companies and, in accordance with the purpose of the law of "adjusting mail operations to the advances in the art of flying and passenger transportation," the air mail contracts became a most vital factor in the whole air transportation system.

Because of this relationship to the passenger and express services as well as the value of the air mail as an agency of rapid communication, the recent events in relation to the air mail contracts have caused widespread apprehension among large sections of the interested public. They have clearly brought out the need for putting the air mail system on a basis which will in the future make this service, and those dependent upon it, free from such uncertainties as recently prevailed.

Exporting American Bombing Planes

● The British aeronautical press views as "comic" the U. S. Government's decision to prohibit American manufacturers from exporting day-bombers with speeds over 175 miles an hour. This action is referred to as "probably another move of President Roosevelt's to hamper the American aircraft industry."

During the early part of the conflict between Japan and China over a year ago, the British Government placed an embargo on armament exports, yet it is conceded that this embargo did nothing to lessen the activities of the nations at war. At that time the British aircraft industry lost a lot of export trade and, therefore, in view of later developments may not quickly decide to follow a similar course in the future.

Naturally the American manufacturers of bombing planes in this category are not in a position to protest at this curtailment of their potential foreign sales, but it is significant that such a handicap is so quickly recognized and seized upon by our friends across the sea. Their amazement at our government's deliberate curtailment of American aircraft sales in foreign countries (which means a loss to us of many dollars) is exceeded only by their amusement at our government's cognitive credulity that such action will minimize the horrors of warfare beyond our borders.

If we will not sell high-speed day-bombers to foreign nations, other leading nations will. Thus we fail to protect ourselves by making it possible for foreign nations to supply other nations with air equipment about which we have comparatively little information, a point which is in addition to the loss of business resulting from the embargo.

Trade with the U. S. S. R.

● American manufacturers of aircraft, parts and accessories are interested in ways and means of promoting the sale of their products in the U. S. S. R. While no blanket rule covers all cases, experience has shown that in regard to products which the Soviet Union is primarily interested in purchasing now (that is, capital goods), all legitimate means should be employed to direct them to the attention of executives and technicians in the Soviet Union.

Soviet authorities know that the United States is capable of supplying a large part of the requirements of the U. S. S. R. and it is felt that the new Export-Import Bank should be a helpful factor in promoting business both to and from the Soviet Union.

Mr. S. S. Shipman, Director of the Information Department of the Amtorg Trading Corporation, has pointed out that purchases abroad are, and will continue to be, conducted by centralized organizations such as the Amtorg Trading Corporation, which negotiates all commercial matters in connection with business in the United States. Although its executives are the final authority in the placing of orders, the initial impetus arises in the factory or the importing organization in the U. S. S. R.

Some of the methods suggested to reach the Soviet purchasing power include advertising material, technical literature, exhibits of machinery and personal contact. In Moscow there are several permanent exhibits of machinery and equipment which are visited by thousands of technicians and managers. In addition to such exhibits of products, Soviet organizations welcome visits from representatives of American firms, and assist in making these visits fruitful. The most satisfactory results have been obtained by those representatives who can furnish technical information and can go into the factory when necessary to demonstrate their products to the foremen and engineers in a convincing manner.

In this issue of AERO DIGEST appears an article giving a brief history of aviation in Russia. It is hoped that this will serve to give a mental picture of the organizations concerned with the development of aircraft and their various uses in the U. S. S. R., and result in a better appreciation in this country of the conditions and aircraft needs in Russia.

Year of the Sea Serpent

CY CALDWELL

● Generations yet unborn (and aren't *they* the lucky guys!) will read in history that 1934 was the year when a sea serpent was seen in Loch Ness, and another one was discovered wallowing off Vancouver Island. Or perhaps it was the same one, commuting. My theory is that it's just Jim Farley in disguise. Ever since poor old Jim bit an air mail operator he hasn't been his old breezy self, but has gone around lashing his tail and roaring in what he hopes will pass for righteous indignation. He has a bad case of collusion of the left patronage gland, and holding it gives him no relief, nor brings him luck.

But whether that Loch Ness sea serpent is Jim Farley or not, it seems to have colored all the events of 1934. Only in a year when a Scotchman sees a sea serpent could so many peculiar things happen. Why, at my miniature country estate at Hopeless-on-Mud, Long Island, where we hadn't had a real snow storm since 1917, I was snowed in twice this year. There was a movement on foot (suggested, I believe, by my friend Gene Vidal), to keep me snowed up indefinitely, but I dug myself out, despite entreaties to stay buried. Yet for several days there I was incarcerated in Fallen Arches, with the wolf howling at the door, and General Johnson, or static (I couldn't tell which), roaring over the radio—my only link with what is humorously called civilization.

Blame It on the Serpent

Then there's been a tremendous increase in sun spots, an old shepherd dog at Saranac Lake was discovered carrying bones to a sick fox, and some one asked Clarence Chamberlin for advice. That's the first time such amazing things have happened, and I blame them all on the sea serpent. First thing you know foreign nations will start returning part of what they owe us, and J. P. Morgan will pay an income tax.

It's been a queer season. The Administration apparently has done away with the law courts and is trying its cases in the newspapers. The evidence is printed or hinted at, and the newspaper editors and good old "Constant Reader" write down their verdicts from day to day, in favor of one side or the other, according to whether the unofficial judge is a Republican or a Democrat. At this writing the score is seven to six in favor of the Air Mail team in the seventh inning.

Now here's what I can't get through my head. If old High Hat Brown and all these air mail operators are guilty of fraud and collusion, why aren't they in jail? Why aren't they, and all of the evidence against them, brought before the Grand Jury to consider? The operators have apparently been tried and found guilty by Senator Black and a lot of newspapers, and they've been fined by having their contracts canceled. Has the New Deal got along to a point where the old-fashioned Grand Jury is considered merely an archaic trapping of Capitalism, now practically defunct?

"Hoot mon, 'tis th' Nude Eel!!"

Well, there's one thing that begins to loom up through the fog of battle. Old Jim Farley seems to be in a tough spot. Unless he's got more on the air mail operators than he and Senator Black have let out yet, old Patronage Jim is not sitting what you'd call pretty. Are those horns sprouting on James' noble skull? And do I merely imagine it, or does he begin to take on the semblance of the well-known goat? You see, Jim canceled the air mail contracts. It's all right for him to come along later and say, "The Big Boss pushed me." But some one is bound to say, "Mebbe. But *you* were Postmaster General—*you* gave the order."

That popular Smiling Chief down there is a pretty wise gentleman. I mean President Roosevelt. He's doing his best to pull us out of trouble, somehow or other, by getting the best advice he can, and then acting on it, or letting some one else act on it. And if some one gets his fingers burnt pulling a hot economic or political chestnut out of the fire, the Chief doesn't even have to put Unguentine on his own fingers.

For instance, do you remember Moley? But probably you've forgotten him. Well, he was a member of the brain trust, until they found out part of what was the matter with it. And then the Chief just quietly dropped him. Moley made a great excursion to London, the economic conference blew up, and he sunk quietly into a nearby pond, leaving scarcely a ripple. All he got was a ride on a boat. The last I heard of him he had become an Editor, which is the next thing to being dead and buried, except nobody is sorry for you.

And do you recall Professor Warren and his gold-buying plan? He went to the Big Chief with his plan and the Chief just listened to Warren with a pleasant smile, and then he turned to the assembled newspaper men and laughed, "Now, boys," says he, "we're going to try a little gold-buying to sort of reinflate, or something. I hope it works to raise prices, but if it doesn't, the fellow who thought of it was named Warren." Well, we tried it, depreciated our dollars, and didn't raise our prices, but we *did* give Europe a bit of a laugh. So that was the end of Warren. And Woodin? Do you recall our first poet-musician Secretary of the Treasury? He's gone back to his scales, writing a new theme for Kate Smith.

Sour Notes Are Sounded

I believe that already the President knows that old Jim Farley made a slight error about this Air Mail Massacre. Irrespective of a legal decision in the matter, the President knows at this writing that some one let him down and let him in for a large cold, wet portion of annoyance-a-la-mode. In the symphony of praise to which he has listened for nearly a year, several sour notes have been sounded in recent months.

Now, you people in the industry, you pilots, mechanics, operating personnel, and investors who have put your money into this cock-eyed business of ours, don't get panicky and don't get mad. There's no sense in doing either. Commercial aviation is necessary to a properly balanced National Defense, and nobody's forgetting it. Least of all, President Roosevelt. He believes in government control for the good of the public. But he doesn't believe in the government being the whole industry. *He still wants to leave something to tax; don't forget that.* The government isn't going to take over all of aviation, any more than it's going to take over the railroads, or the steamships, or the automobile or the steel industries. That isn't our American way, and the President is first and foremost an American. I'm banking on him—and at that I

(*Continued on page* 76)

AIRWHEEL

TIRES
AND
BRAKES
make any field a landing field

WHEN you fly you must always face this fact—*sometime* you may have to set your ship down quick in the first clear space that offers.

You won't have any choice then, so it is wise to choose now the dual protection that only Airwheels and Airwheel Hydraulic Brakes afford in heading-in to muddy, rough or even plowed ground—

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Just one emergency landing, in a place that looks o.k., may cost much more than a whole set of Airwheel Tires and Brakes. That is why the leading transport lines are adopting them as standard equipment. How about you?

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WHEN YOU BUY A NEW SHIP
SPECIFY GOODYEAR AIRWHEELS
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AIRWHEEL HYDRAULIC BRAKE

NRA
WE DO OUR PART

The Curtiss-Wright Corporation

ITS HISTORICAL DEVELOPMENT, SCOPE OF ACTIVITIES AND EXECUTIVE PERSONNEL

THE FIFTH OF A SERIES OF FEATURE ARTICLES RELATING TO THE MAJOR AERONAUTICAL ORGANIZATIONS OF THE UNITED STATES

● When the Curtiss-Wright Corp. was formed in August, 1929, it brought together the names of the most illustrious pioneers of aviation—the Wright brothers and Glenn Curtiss. As it exists today, the organization consists chiefly of three manufacturing subsidiaries—Wright Aeronautical Corp., producers of air-cooled and water-cooled engines; Curtiss Aeroplane and Motor Co., manufacturers of military aircraft in the Kenmore plant at Buffalo, N. Y., and the Curtiss-Wright Airplane Co. of St. Louis, Mo., producers of commercial aircraft. In addition, the Curtiss-Wright Export Corp. handles the export of aircraft and engines for the entire group as well as many other aeronautical manufacturers, and the Curtiss-Wright Airports Corp. owns and leases airports for the purpose of operating a sales and service organization for commercial and private fliers.

Effective combination of these activities requires co-ordination and planning which is the function of the Curtiss-Wright Corp. At present, there are 6,723,247 shares of the common stock and 1,147,568 shares of the class A, with a par value of $1 per share outstanding. The Curtiss-Wright Corp. holds an average of 98% of the total stock of the subsidiary companies while the outstanding stock of Curtiss-Wright is held by some 100,000 stockholders. Officers of the Curtiss-Wright Corp. are also officials of the operating units. For instance, T. A. Morgan, president of the Curtiss-Wright Corp., is either president or chairman of the board of all operating units. J. A. B. Smith, senior vice-president and treasurer, is also president of the Curtiss Aeroplane and Motor Co., Inc., and J. S. Allard, vice-president of the Curtiss-Wright Corp., is also president of the Curtiss-Wright Export Corp.

Thomas A. Morgan

Bulk purchases, the use of export facilities by all, and the division of corporation expenses (including legal and patent fees, auditing, advertising, publicity, insurance, etc.) make it possible to provide these services at lowered costs. In addition to this, such an arrangement results in close co-ordination between matters of policy and methods of operation.

WRIGHT AERONAUTICAL CORPORATION

● Six years after they made the first flight at Kitty Hawk, N. C., Orville and Wilbur Wright organized the Wright Co. with a capitalization of $1,000,000 and set into motion the business which today is the Wright Aeronautical Corp. They sold their stock to a syndicate in 1915 and their company was merged with the Glenn Martin Co. of Los Angeles in 1916, but Orville Wright continued his experimental work at Dayton, Ohio, as chief consultant engineer for the new combine, the Wright-Martin Co.

With the war continuing in Europe, representatives of the company believed the Hispano-Suiza engine most adaptable for war purposes and when France ordered 800 of these engines, an order for 450 was subcontracted to the General Aeronautic Co., a subsidiary of the Wright company which handled foreign business. It was this order, and the necessity of entering immediately upon quantity production, that led to the formation of the Wright-Martin Co. About this time Guy Vaughan, now president and general manager, joined the organization as quality manager.

The first order came from the U. S. Government in July, 1917, when the Wright-Martin Corp. had nearly 1,000 identical engines on order. From July to November, 1917, was a period of concentration upon the 150 h.p. job, and by the end of the year, through the erection of new buildings, the increasing of the tool equipment and the re-arrangement of the old equipment, the new company was well prepared for quantity production.

In November, 1917, the government requested the corporation to be ready to manufacture the 300 h.p. Hispano-Suiza, on which French engineers had been working, as well as the 150 h.p. type, and early in 1918 the designs of the 300 h.p. were finished and some new features which added to its reliability were introduced. This engine proved acceptable to the French and British governments, and in May, 1918, the corporation received authority to put it into quantity production. All was set for

J. A. B. Smith

J. S. Allard

G. W. Vaughan

R. S. Damon

T. P. Wright

B. S. Wright

W. F. Goulding

a monthly production of 100 motors, a schedule which would have called for nearly 15,444 men and would have been reached early in 1919 had the war continued.

From an Hispano-Suiza production of about $2,000,000 value per year in September, 1917, an increase to about $50,000,000 per year was reached in the New Brunswick factory alone by October, 1918, and this despite a large decrease in the price paid per motor.

From an order for a few hundred motors in the summer of 1917 the corporation had a schedule for the summer of 1919 calling for a total of about 2,000 a month and spares. At the end of the war orders on the books totaled about $50,000,000.

After the war the Wright officials decided to continue in the further development of engines, leaving the building of planes to others, a policy which early in 1920 necessitated the dissolution of the Wright-Martin Aircraft Corp. and the formation of the Wright Aeronautical Corp. under which name the company now operates.

Work on the 150 h.p. model I engine, the 180 h.p. model E and the 300 h.p. model H continued at a new plant in Paterson, N. J., and improvements on the Hispano-Suiza types became so pronounced and frequent that the models were produced as Wright engines.

Records by these new engines continued to mount. A Thomas-Morse with Wright engine in February, 1919, broke the world's speed record at 163.66 miles per hour.

In the Pulitzer race in 1921 Lt. John Macready, flying a Thomas-Morse pursuit plane powered with a 300 h.p. Wright took second place with a speed of 160.71 miles per hour.

The company developed a dirigible engine in 1921 completing the design, building and testing in nine months. With displacement of 1850 cubic inches and delivering 400 h.p. at 1400 r.p.m., this was a larger engine than had been used for such service.

About this time the water-cooled model T twelve-cylinder type, designed in cooperation with the U. S. Navy primarily for marine use was developed; it had a displacement of 1947 cubic inches and originally was rated 525 h.p. at 1800 r.p.m., but later increased to 600 and finally to 675 h.p.

In 1914 Charles L. Lawrance began to manufacture air-cooled engines on a small and experimental scale, developing two- and three-cylinder types. In the course of development came the World War and as these engines were not sufficiently advanced for general military use, they played no important part in the conflict. The Army, however, tested the three-cylinder engine and after it had passed a successful test of fifty hours, gave the Wright company an order for the design and construction of a 350 h.p. engine of this class. The R-I, the first large air-cooled radial engine to be operated satisfactorily in America, was then built.

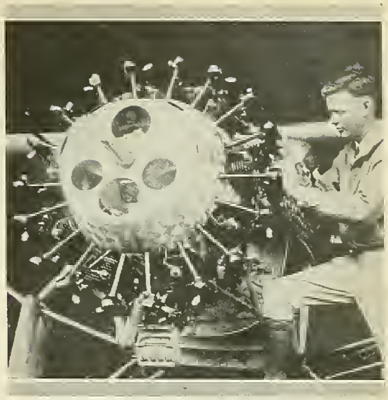
In the meantime both the Army and Navy decided that nine-cylinder air-cooled fixed radials would be valuable in producing 150- to 200-h.p. types and gave the Lawrance company contracts for two sizes of these. The smaller was discontinued but the larger became the J-1, forerunner of the present Whirlwind and Cyclone series engines.

Convinced of the excellence of the Lawrance engine, which showed its merit in winning the Curtiss Seaplane Trophy Race in 1922, the Wright company acquired by merger the assets and business of the Lawrance company. Mr. Lawrance became vice-president of the Wright company and later president, continuing the work of perfecting the air-cooled type engine.

The Whirlwind J-3 added a number of refinements and improvements and later came the Whirlwind J-4, which sprang rapidly into favor and almost universal use.

The most outstanding feat accomplished with the Whirlwind J-4 was the flight in 1926 from Spitzbergen over the North Pole and back, accomplished by Admiral Byrd and Floyd Bennett in 15 hours 30 minutes, the flight marking the first time an airplane had flown over the pole.

In 1925 announcement was made of the P-1, developed from the Whirlwind J-4 but having a power rating of 450 h.p. This engine was subsequently developed into the P-2 and finally into the 525 h.p. R-1750, forerunner of the present Wright Series F Cyclone engines.



Lindbergh and "The Spirit of St. Louis"

In 1926, as the result of service experience and research, the Whirlwind J-4 became the Whirlwind J-5 and its initial rating of 200 h.p. was, by improvements, increased to 225 h.p.

From its inception, the Whirlwind J-5 proceeded to demonstrate its dependability and performance through outstanding achievements. One was installed in the Wright Bellanca monoplane which, in the New York Air Races of 1925, won the Light Efficiency Trophy. In the same event it was second only in speed to a plane specially prepared for racing.

In the 1926 National Air Races at Philadelphia this plane captured three out of four possible first prizes in the two events in which it was entered, and in the contest for the Aviation Town and Country Club of Detroit Trophy for light commercial planes, it won first place in efficiency by carrying 1,145 lbs. of ballast at 121.36 miles per hour. In the contest for the Detroit News Air Transport Trophy, for commercial planes of large load carrying capacity, it carried 1,607 lbs. ballast at an average speed of 121.28 miles per hour, winning first prize both for efficiency and speed.

The first record breaking achievement with a Whirlwind J-5 powered plane was the endurance record of 51 hours 11 minutes established on April 12, 1927,

E. S. Cramer

M. B. Gordon

B. G. Leighton

G. F. Chapline

Arthur Nutt

P. B. Taylor

W. S. Leaycraft

Some Wright engines: The 175 h.p. Whirlwind; 420 h.p. Whirlwind; 700 h.p. Double-row fourteen-cylinder Whirlwind; 700 h.p. Cyclone, and the 735 h.p. supercharged and geared Cyclone

by Clarence Chamberlin and Bert Acosta in the Wright Bellanca.

The increase in orders which followed the epochal flights of 1927-28 made it imperative that the Wright factory be expanded. During the latter part of 1927, several new wings were added to the single building which constituted the original Paterson plant. It has more than 650,000 feet of floor space and is capable of producing more than 500 engines per month. It includes the only foundry in the world devoted exclusively to the manufacture of aluminum castings for aviation engines and an experimental division which is equipped with every facility needed to carry on the research, development and testing of new types of aircraft engines. The average payroll totals more than 1500 employees.

Among flights by Whirlwind J-5 powered planes in 1928 was Wilkins' flight over the North Pole.

In 1929, to meet the demands for a wider range of reliable and efficient power plants, the Wright company developed and introduced a five cylinder model rated 165 h.p. at 2,000 r.p.m. (the Whirlwind 165); a seven-cylinder model rated 225 h.p. at 2,000 r.p.m. (the Whirlwind 225) and a nine-cylinder model rated 300 h.p. at 2,000 r.p.m. (the Whirlwind 300). These engines were so constructed that more than 90 per cent of their component parts were directly interchangeable.

A year later the power output of the seven-cylinder Whirlwind was increased and the engine redesignated as the Whirlwind 240.

In order to provide service for the operator in the field, the Wright company developed in 1929 and 1930 a nationwide chain of 88 service depots which provide overhaul and repair stations at all important aviation centers.

The new series of Whirlwind engines continued to add to the list of achievements credited to their predecessors. In the National Air Tours of 1929, 1930 and 1931 Wright-powered planes not only finished first but won many other places as well. In 1930, the Hunter brothers established an official world's endurance record of 557 hours with a Whirlwind-powered Stinson.

Various refinements were made in the Whirlwind engines in 1930 which resulted in higher power outputs with improved performance. The principal improvement consisted of a new type of cylinder head, the type E, which featured integral spark plug coolers and more closely spaced fins. During the same year, a 420 h.p. nine-cylinder Whirlwind was built experimentally and installed in a Travel Air Mystery ship purchased by the Texas Company for Captain Frank Hawks. With this plane Hawks broke more than 30 American and European speed records and in one of his most outstanding flights, Hawks had breakfast in London, luncheon in Rome and returned to London for tea the same day.

The 525 h.p. Cyclone introduced in 1927 was enlarged and refined in 1930 into the Cyclone 575, a nine cylinder radial air-cooled engine of 1820 cubic inches displacement rated 575 h.p. at 1,900 r.p.m.

Production of the new E type Whirlwinds (including the 420 h.p. model) was begun in 1931. A year later the approved power of all models except the Whirlwind 420 was increased by the Department of Commerce. The nine-cylinder Whirlwind 300 became the Whirlwind 330 rated 330 h.p. at 2,000 r.p.m. Increases of 10 h.p. each in the seven and five-cylinder Whirlwinds brought the horsepower ratings of these engines up to 250 and 175, respectively. More recently through the use of higher compression pistons, ratings of 365 h.p. for the nine-cylinder Whirlwind and 285 h.p. for the seven-cylinder Whirlwind have been established.

In 1929, as the result of the merger of the Curtiss and Wright interests, the Wright Aeronautical Corp. became the aircraft engine manufacturing division of the Curtiss-Wright Corp., and in 1931 the engine division of the Curtiss Aeroplane and Motor Co. was consolidated with Wright which then became the sole engine manufacturing unit of the group and acquired the Curtiss Conqueror, D-12, and Challenger engines.

The Curtiss D-12 is a twelve cylinder Vee water-cooled engine of 1,150 cubic inches displacement and a power output of 435 h.p. The Conqueror is a further development of the D-12. This engine has a displacement of 1570 cubic inches and at that time was rated at 600 h.p. at 2,400 r.p.m. The Challenger is a six cylinder, staggered, radial air-cooled engine rated 185 h.p. at 2,000 r.p.m.

In 1932, the Wright Aeronautical Corporation continuing development instituted by the Curtiss Aeroplane and Motor Co., brought the Conqueror to the point where it could be operated with either water or prestone as the coolant, a feature possessed by no other engine. The advantage of using prestone is that it requires smaller radiator surface. The Conqueror is now available in either direct drive or geared form, with two ratios of propeller speed reduction gears offered. The present power of the Conqueror unsupercharged is 675 h.p. at

2,400 r.p.m. at sea level as a direct drive engine and 650 h.p. at 2,450 r.p.m. at sea level as a geared engine.

A supercharged model of this engine known as the Super Conqueror is also available. This engine equipped with a gear-driven centrifugal supercharger has a power output of 750 h.p. at sea level and 600 h.p. at 12,000 feet altitude.

In June, 1932, the Wright Company announced a series of Cyclone engines known as the R-1820-F, the engine now being rated by the Department of Commerce at various outputs ranging from 600 h.p. to 715 h.p. at 1,950 r.p.m. at sea level, to 710 h.p. at 1,950 r.p.m. at 7,000 feet. A supercharged and geared Cyclone is rated at 735 h.p. at 1,950 r.p.m. at 4,000 feet. At its ratings of 710 and 715 h.p. it weighs only slightly more than 1.22 pounds per horsepower. The Series F Cyclone has been approved by the Department of Commerce for seven ratings and is available either as a direct drive engine or a geared engine with propeller speed reduction gears of 8:15 or 16:11 ratio. The 16:11 ratio gear is of Wright design and consists entirely of spur gears, making it exceptionally compact.

The Series F Cyclone has been selected to power many of the latest type of high speed transports and military planes. Transports powered by Series F Cyclones include the Curtiss-Wright Condor, Airplane Development Corp. V-1, General Aviation GA-43, Douglas Airliner, Northrop Delta, Consolidated Fleetster, and the Fokker transports being built in Holland for the K. L. M. airlines.

A few of the military types powered with Series F Cyclones include the Martin bomber, the Curtiss A-12 attack, the Curtiss YO-40B, the Grumman FF-1 Fighter, the Curtiss F11C-2 fighter, the Curtiss Hawk Seaplane, the Northrop Attack, the Curtiss Falcon, Curtiss Navy F11C-3 fighter, Consolidated Patrol flying boats.

Airlines in this country using Wright Series F Cyclones to power new equipment include Transcontinental and Western Air, Inc., Eastern Air Transport, American Airways, Pan American Airways and Western Air Express.

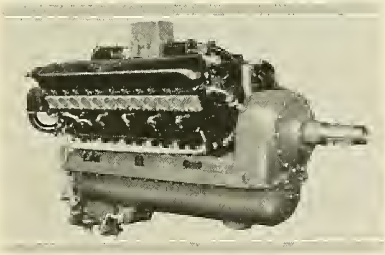
Last year the Wright company developed for the U. S. Navy the double-row radial air-cooled engine, a 14-cylinder type with a displacement of 1,510 cubic inches. It is rated 700 h.p. at 2,300 r.p.m. at sea level and has a variety of altitude ratings and features a low overall diameter of 45 inches. The double-row Whirlwind has the same 11-inch diameter supercharger impeller operating at low speeds and the same simplified rear section as the Series F Cyclone.

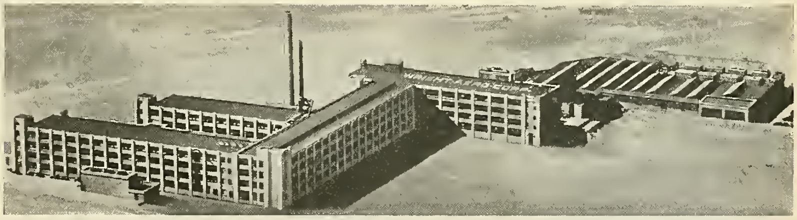
Wright engines are now used in 46 countries of the world for both military and commercial purposes, and in addition to being manufactured at the Wright plant at Paterson, they are built outside of the U. S. under license by Canadian Wright, Lt., in Canada and by the Argentine Government. Recently a license agreement was also negotiated with the U. S. S. R. for the construction of Whirlwind and Conqueror aviation engines in Russia.

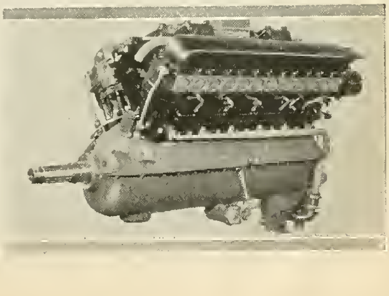
Wright engines now hold the following world records: Closed circuit refueling endurance record, 647 hours by Jackson and O'Brine in a Curtiss Robin, Challenger powered; non-stop refueling-in-flight endurance distance record, 7,200 miles by Mamer and Walker with Whirlwind powered Buhl; non-stop oversea mass formation flight, San Francisco to Honolulu, 2,408 miles, by U. S. Navy squadron of Consolidated Patrol Boats powered by Cyclones.

Wright engines have been used on more than 60 famous flights, some of which are: Lindbergh, New York to Paris, first solo crossing of the Atlantic; trans-Atlantic flights of Chamberlin, Byrd, Earhart and Stultz, Williams and Yancey; Kingsford Smith's flight around the world; Admiral Byrd's flights over the North and South Poles and across the Atlantic; Frank Hawks 30 American and European speed records; Colonel and Mrs. Lindbergh's flight from Washington to Tokyo and their 30,000-mile survey for Pan American Airways; Boardman and Polando's 5,011-mile flight from New York to Istambul, Turkey; the flight of the DO-X from Germany to New York via the South Atlantic and return; and the TWA Douglas Airliner's record flight of 13 hours 4 minutes from Los Angeles to New York.

The present officers of the Wright Aeronautical Corp. are: Guy W. Vaughan, president and general manager; Myron B. Gordon, vice-president and assistant general manager; B. G. Leighton, vice-president; Arthur Nutt, vice-president of engineering; James J. Donahue, treasurer; Charles C. King, comptroller and assistant secretary; George Chapline, sales manager, and P. B. Taylor, chief engineer.







Plant of Wright Aeronautical Corp., at Paterson, N. J.

ABOVE: The geared Conqueror engine, 650 h.p.

RIGHT: The Conqueror, direct drive, 675 h.p.

CURTISS AEROPLANE & MOTOR CO., INC.

● Glenn H. Curtiss—the founder and guiding genius of the predecessors of the present Curtiss Aeroplane and Motor Co., Inc., made his first contact with aviation in 1904 when Major Thomas Scott Baldwin came to him for an engine for his airship, the *California Arrow*. With this air-cooled engine, the *California Arrow* accomplished a circular flight at Oakland, California, in August, 1904, it being said to be the first navigable airship in America to make such a flight.

Soon all exhibition airships in the country were powered by Curtiss engines and the first contract ever awarded for a navigable balloon by the United States Government went to Baldwin. It was built in 1905 at Hammondsport, N. Y., powered by the first water-cooled aeronautical motor built by Curtiss and made a two-hour flight at Fort Myer, Va.

Dr. Alexander Graham Bell, inventor of the telephone, had taken an active interest in flight and Curtiss met him in

Cyclone-powered Curtiss Falcon observation

Cyclone-powered Curtiss Falcon seaplane

Cyclone-powered Curtiss "Goshawk" fighter

Cyclone-powered Curtiss Hawk seaplane

1905, when Curtiss was asked to build a motor for a tetrahedral kite plane with which Dr. Bell was experimenting. However, it was not until the summer of 1907 that Curtiss was able to visit Dr. Bell at Baddeck, Nova Scotia, his summer home. There he met F. W. (Casey) Baldwin, J. A. D. McCurdy, and Lieut. Tom Selfridge, of the U. S. Army, all interested in building a practical airplane, and when Mrs. Bell agreed to finance the work, the group formed The Aerial Experiment Association with Curtiss being director of experiments. In the fall of 1907 the work was moved to Hammondsport, N. Y., and after a few weeks spent on glider experiments, it was decided to build power machines. Out of these efforts resulted the construction of several original types of airplanes.

The *Scientific American* offered the first trophy in this country for aeroplane flights, and the winner for 1908 was to be the first to fly one kilometer in a public, officially-observed, previously-announced flight. On July 4th, 1908, Glenn Curtiss won the first leg on this trophy, fulfilling all requirements, and for good measure continuing on beyond the course to complete a full mile. Early in 1909 the Aerial Experiment Association dissolved, Curtiss turning his interest to flying over water.

In 1909, the New York Aeronautical Society placed the first order for an aeroplane given to an American manufacturer with Curtiss. This machine was completed in June and demonstrated at New York City, and on July 17th flew around a closed circuit, a distance of 24.7 miles, to win the second leg on the Scientific American Trophy. As a result, Curtiss was chosen to represent the Aero Club of America in the first international aviation meet held in August, 1909, at Rheims, France, and with a new machine, powered by a Vee type water-cooled engine, won the first international speed trophy, the Gordon Bennett cup.

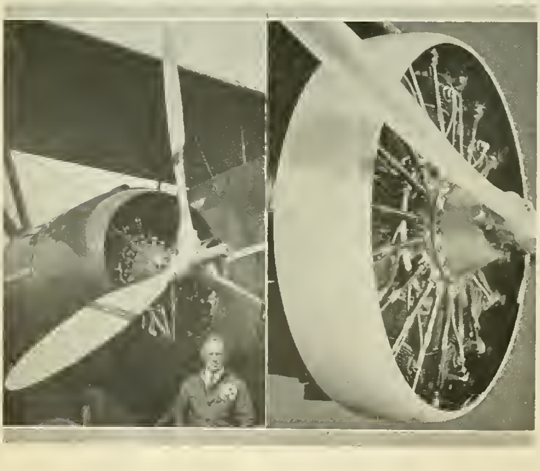
During the next few years Curtiss built numerous new machines and engines, instructed Army, Navy and foreign officers, built a machine which was flown from the deck of a battleship, exhibited planes throughout the country, and formed the Curtiss Exhibition Co., the country's first flying service. On May 31, 1910, he made his Albany-New York flight down the Hudson River, winning the $10,000 prize offered by the New York *World*, and the final leg of the Scientific American Trophy.

Curtiss was among the few who, in the early days, visualized the need and importance of airplanes in warfare. In 1910 he demonstrated aerial bomb dropping and sharpshooting and the reception of wireless messages from an airplane in flight. He inaugurated the first flying school at Hammondsport in 1910, and followed this with others at San Diego, Cal., and Miami, Florida.

Curtiss retained his interest in building an airplane which would take off from the water, and on January 26th, 1911, made the first successful flight in a hydro-aeroplane, while on February 23rd he demonstrated the first successful amphibion. In 1912, Curtiss having perfected the first flying boat, went to Europe and established a number of agencies; designed in 1913 a tractor fighting plane for the U. S. Army, the first JN, forerunner of the famous "Jennies" and developed the OX engines at the Hammondsport plant in 1914. British officers sent to America proclaimed the JN the most perfect airplane yet developed. Business increased and in a little more than a year the Jenny was one of the most useful planes in the British and American training services.

In 1918, the Curtiss Aeroplane and Motor Co. came under the control of J. N. Willys and the Willys-Overland Co., Curtiss, however, remaining as chairman of the board of directors. A considerable number of the new Oriole landplanes and the Seagull flying boats were produced. Curtiss had visualized airplanes carrying mail, for exploration, travel, transportation and pleasure, and when the war ended, he directed his energies along these channels. The Curtiss Exhibition Co. was reorganized as the Curtiss Flying Service to handle all phases of airplane commercial activity except manufacture of planes and engines.

While the commercial field did not bear out the promise of the post-war period, the Curtiss Aeroplane & Motor Co. continued to build new military and commercial models and to pioneer in engineering developments. In the plant at Garden City, New York, the latest equipment for tests and experiment were in-

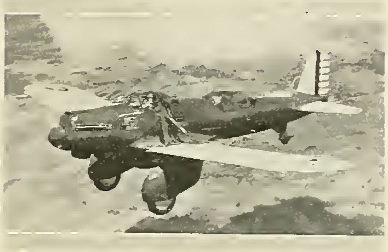


LEFT: Curtiss electrically-operated controllable pitch prop, part of equipment on the Curtiss-Wright Condor bombers

RIGHT: Curtiss anti-drag ring, in extensive use for the past four years

Cyclone-powered Curtiss YO-40B observation

Conqueror-powered Curtiss P-6E pursuit



Conqueror-powered Curtiss A-8 "Shrike" attack

Cyclone-powered Curtiss A-12 attack

stalled, with three wind tunnels being used.

In 1919, the Curtiss Eagle aerial liner was built and the NC boats were finished, the first trans-Atlantic flight being completed by the NC-4. Also in 1919, Roland Rolfs flew a Curtiss Wasp plane to a new world's altitude record of 32,450 feet. Developments continued through 1920 and 1921, and Curtiss built the first of a series of Schneider Cup and Pulitzer Cup racers. These racing planes, with Curtiss engines, brought to America the world's records for both land and seaplanes at increasing speeds each year. In 1922 and 1923 the NBS-1 bombers, the TS-1 seaplanes, and several mail ships were built, as well as the first Curtiss Army pursuit plane with the new D-12 400 h.p. Curtiss engine.

In 1924 the first of the famous Hawk fighters (with D-12) was developed, showing a high speed of 187 miles per hour. The Falcon observation, and the twin engine Condor bomber were also produced for the military services, and the Carrier Pigeon for mail and cargo. Curtiss racers with Curtiss engines continued to make new records, winning the Pulitzer and Schneider races and the first coast-to-coast "Dawn to Dusk" flight was made by Lieut. Maughan in a Curtiss pursuit plane. In 1925 racing plane development as well as new models for the Army and Navy continued, and the 4-place Lark cargo and passenger plane was introduced. Various engines were adapted to the pursuit and observation types through 1926 and 1927, and new engines were built to meet military and commercial demands, including the V-1550 and Conqueror engines.

Admiral Byrd's flight over the North Pole in 1926, and the several trans-Atlantic flights in 1927 resulted in rapid expansion in aviation, particularly in the commercial field. The Robin and the Fledgling—the latter a trainer type also used by the Army and Navy—were built in 1928. Entering the commercial field in all branches in 1929, Curtiss marketed the 20-passenger Condor transport, the 8-passenger Kingbird and the Carrier Pigeon mail plane, as well as the Robin and Fledgling. The Robin was built by Curtiss-Robertson Airplane Co.

On July 23, 1930, Mr. Curtiss died at Buffalo, N. Y., and aviation lost one of its greatest personages.

In 1930 the Curtiss company completed the development of the 21-place Condor transport, the first of the bi-motored transports to go into airline service and incorporating the most modern features for the comfort of air travel. During this year, the company produced the A-3B attack plane for the Army as well as the 2-place O1G observation biplane, both of which were powered by the D-12 engine. They also delivered Helldivers and Hawk fighters to the U. S. Navy.

In the past three years the company has devoted its efforts to the building of fighters and observation planes for the Navy and pursuit, attack and observation planes for the Army, in 1931 delivering to the Air Corps 46 type P-6E Hawk pursuits powered by Prestone-cooled Curtiss Conqueror engines while in 1932, the company delivered 13 650 h.p. Prestone-cooled Conqueror A-8 Shrike attack planes to the Army. This low-wing, all-metal plane is equipped with slots and flaps and carries 5 machine guns in addition to fragmentation bombs and a large bomb. The Army later bought 46 type A-12 attack monoplanes, similar to the A-8's, with the exception of the power plant, which is the 700 h.p. Cyclone. Last year the company delivered 28 Hawk biplanes, equipped with single strut landing gear and powered by the new 700 h.p. Cyclone to the U. S. Navy "High Hat" squadron as well as a new observation high-wing monoplane, equipped with slots and flaps and retractable landing gear to the Army Air Corps, five of them now undergoing service tests.

In the latter part of 1933, Curtiss developed a new electric controllable pitch propeller which operates by means of a small electric motor which is geared to the propeller blades with a ratio of 36,000 to 1. Due to the fact that the blades can be feathered, it adds to the efficiency of the twin-motored transport, increasing its climb, ceiling, and cruising speed with only one engine in operation. Also production has continued on the Curtiss anti-drag ring which has been widely used throughout the world.

Officers of the Curtiss Aeroplane and Motor Co. are J. A. B. Smith, president; T. P. Wright, vice-president and gen-

Plant of the Curtiss Aeroplane & Motor Co. at Buffalo, N. Y.

eral manager; Burdette S. Wright and B. G. Leighton, vice-presidents; George S. Lapp, treasurer; R. R. Reger, secretary; Joseph P. Healey, assistant treasurer and assistant secretary, and C. C. King, assistant secretary.

CURTISS - WRIGHT AIRPLANE CO.

● The Curtiss-Wright Airplane Co. (Missouri) was originally incorporated as the Curtiss-Robertson Airplane Manufacturing Co. in January, 1928, to develop and manufacture airplanes for civil and commercial use, and to segregate the commercial manufacturing interests of the Curtiss Aeroplane and Motor Co. from the military production in its plants at Garden City and Buffalo, New York.

The factory of the Curtiss-Wright Airplane Co. on Lambert-St. Louis Municipal Airport at Robertson, Missouri, occupies 144,000 square feet where more than 1,200 commercial airplanes, valued at approximately $5,448,044 have been built since its inception in 1928 and through the calendar year of 1933. Models developed and constructed there range from the small Junior (built in 1931), which retailed for less than $1,500 to the $60,000 Condors which carry 15 passengers and a crew of two or three.

The first model built in 1928 was the OX-5 Robin, a 3-place, cabin high-wing monoplane which, early in 1929, was modified to take the new Challenger 170 h.p., and the Whirlwind 165 h.p. engine. It was one of these planes, flown by Dale Jackson and Forrest O'Brine, which in 1929 established a world's endurance record of 420 hours 21 minutes. Later when this record had been broken by the Hunter brothers, this same model again established a new world's refueling endurance record of 647 hours 28 minutes 30 seconds, a record which still stands. By the end of 1929 more than 700 Robins with either the OX-5, Challenger or Whirlwind engines had been produced, setting a peace-time production record for one model.

Curtiss-Wright Condor transport

Curtiss-Wright plant, Robertson, Mo.

In 1930, owing to the decline in the commercial market, the Moth Aircraft Corp. was consolidated with the Curtiss-Wright Airplane Co., the Robertson plant taking over such inventories and development charges of the Moth company, and manufacturing such Moth airplanes as could be sold in the then existing market.

During 1930 the Thrush, powered with the Whirlwind 240 h.p. engine, was produced and marketed in limited quantities along with a few Robins and Moths. In this same year the company, believing a market existed for a small bi-motored airline feeder ship, developed the 8-place Kingbird and manufactured this model during the latter part of 1930 and the first half of 1931.

When it subsequently became apparent that the commercial operations, which were being conducted by the Travel Air Co. at Wichita, and the Curtiss-Wright Airplane Co. at Robertson, would have to be concentrated at one factory, the Robertson plant was selected. The Travel Air models which were taken over and continued in production as demanded were the two-seater biplane Sport, three-seater biplane Speedwing, four-place cabin monoplane Sedan, and six-place cabin monoplane. At the same time the Robertson plant developed the Junior, 300 of which were built and marketed under adverse economic conditions during 1931.

In 1932, the two-place Travel Air was modified into a light trainer for civil and sport purposes, and the Osprey, a two-seater military fighter for export, was developed and marketed. At this time practically the entire engineering staff was concentrated upon the development of the new Condor. The airplane, with a wing span of 82 feet and weighing more than 8½ tons, is powered by two 700 h.p. Wright Cyclone geared engines, is equipped with a retractable landing gear, carries 15 passengers, 2 pilots, and 650 pounds of mail, baggage and express at a top speed of 170 miles per hour at sea level. The first of these new planes was delivered in March, 1933, to Eastern Air Transport and its success is indicated by the fact that during the year nine were delivered to that company, nine to American Airways and two to the U. S. Army Air Corps for transport use. After the first nine Condors had been placed in operation by American Airways, ten more were ordered and are now under construction. Sales were made to Swissair Lines, who operate a high speed transport service in Europe and to Admiral Richard E. Byrd for use in the Antarctic on floats and skis. The new Condor models, now under construction, will have supercharged engines, and a top speed of about 190 miles per hour at 8,000 feet.

Curtiss-Wright Speedwing

Lindbergh's Cyclone-powered Lockheed

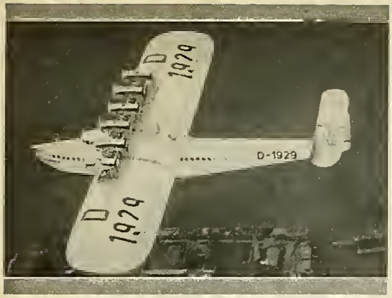
Production at the Robertson plant at present necessitates the employment of between 400 and 500 men.

The company's executive staff is headed by President Ralph S. Damon whose associates are G. J. Brandeweide, vice-president; R. R. Reger, secretary; G. M. Ebert, treasurer and assistant secretary and George A. Page, chief engineer.

CURTISS - WRIGHT EXPORT CORP.

● The Curtiss-Wright Export Corp. was orginally formed as the Curtiss Aeroplane Export Corp. in 1921, to act as foreign representative for the Curtiss Aeroplane and Motor Co., and later, following the merger, for all companies of the Curtiss-Wright group.

Due to its foreign connections it has been able to make arrangements with domestic manufacturers for a diversified line of aeronautical equipment and products allied with the aviation industry, and in addition to representing its associate companies, the Export Corp. has sold airplanes and engines manufactured by vari-



The DO-X with twelve Conquerors

ous companies outside of the Curtiss-Wright group whose products have not been in direct competition with anything manufactured by the Curtiss-Wright units.

Acting as foreign representative for these various manufacturing units this company has given them world-wide representation, and has enabled the economical maintenance, for each unit, of an organization which otherwise would result in greatly increased costs and duplication of effort.

Curtiss-Wright exports during 1933 totaled $3,550,000, an increase of 35% over 1932, and approximately 40% of the total 1933 aeronautical exports from the United States.

105 airplanes, including Hawk single seat fighters and Falcon observation biplanes powered by the new Cyclone engine, training planes, powered by Whirlwind engines, and Osprey fighters, powered by a Whirlwind 420-horsepower engine, constituted the larger part of the export shipments. In addition, a large number of Whirlwinds, Cyclones and Conqueror engines were exported, chiefly for installation in airplanes of foreign manufacture. The Fokker Co. in Holland have completed a tri-motor and are building a 4-motored monoplane both of which are powered by Cyclone engines. These planes are for K. L. M. airlines, which operates between Amsterdam and Batavia, a distance exceeding 9,000 miles. Wright engines are also used on other European transport lines, including Avio Linee, operating between Rome and Zurich; by Swissair between Zurich and Vienna; by Deruluft Air Lines between Berlin and Moscow; by Czechoslovakian Air Transport Co., China Airways, Turkish Airways, Japanese Air Transport, L. A. P. E. Air Transport, L. O. T. Airline as well as in Canada, Mexico, Alaska, New Guinea, Australia, and many South American countries.

The extent to which the American aviation industry is developing its markets throughout the world is indicated by the fact that shipments were made by Curtiss-Wright during the past year to Russia, Japan, China, Germany, Spain, Poland, Switzerland, France, Holland, Italy, Czechoslovakia, Sweden, Bulgaria, Mexico, Guatemala, Honduras, Santo Domingo, Porto Rico, Cuba, El Salvador, Canada, Alaska, Australia, Philippines, Turkey, the Dutch Indies and practically all South American countries.

The Argentine government in their plant at Cordoba, the only aircraft engine plant in South America, carried on the manufacture of Cyclone engines through a license agreement with the Wright Aeronautical Corp.

Last year license arrangements were completed with the Turkish government for the manufacture of Hawk pursuit biplanes and Fledgling training planes in a plant at Kayseri. They have also operated their first airline between Istambul and Ankara for more than a year, using Whirlwind-powered Kingbirds flown by American pilots in the employ of the Turkish government. Wright Aeronautical also completed license arrangements with the U. S. S. R. for the manufacture of Cyclones and Conqueror engines in Russia.

China, during the past few years has carried on a most aggressive program to build up its air force. During 1933, that government purchased 50 Cyclone-powered Hawk pursuit biplanes, as well as a number of Curtiss-Wright training planes, and arrangements are now being completed for the manufacture of Curtiss military planes in that country.

Since the close of 1933, Swissair Lines have purchased a Curtiss-Wright 15-passenger Condor to operate between Zurich and Vienna and arrangements were completed with Commander Frank Hawks to go to China to demonstrate the new Curtiss-Wright Condor Bomber to the Chinese government. Besides its use as a military ship, the Condor (illustrated on the frontispiece of this issue) can be adopted to other purposes, including the transportation of troops and the carriage of sick and wounded. Without making any changes in the construction, 12 stretchers may be installed for the latter purpose.

J. S. Allard is president of the Curtiss-Wright Export Corp., while other officers are B. G. Leighton and W. F. Goulding, vice-presidents; E. S. Cramer, treasurer, and R. R. Reger, secretary. Thomas A. Morgan is chairman of the board.

Curtiss-Wright Condor bomber for China

CURTISS - WRIGHT AIRPORTS CORP.

● The Curtiss-Wright Airports Corp. was organized in May 1929 to establish, at strategic points throughout the United States, airports and facilities to supply the demand of the commercial flying industry.

Soon after, the corporation acquired land sites at eleven points throughout the United States.

By the fall of 1930 airports were established on company owned properties at North Beach and Valley Stream, N. Y.; Los Angeles and San Mateo, Calif.; Chicago and E. St. Louis, Ill.; Baltimore, Md.; Caldwell, N. J.; Cleveland, O.; Milwaukee, Wis., and Pittsburgh, Pa.

In addition to these sites long term leases were acquired on land sites at Alameda, Calif., and New Brunswick (Hadley Field), N. J.

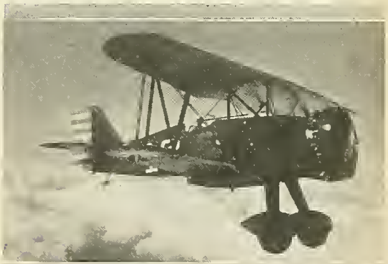
All of these properties were improved by the erection of terminal facilities, hangars, general facilities including machinery and equipment for service and repair work, and by the installation of surface drainage systems, boundary and flood lights and hard surfaced runways, and the field facilities in general were improved with all types of necessary appurtenances.

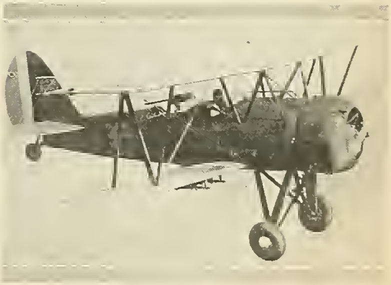
The structures are of brick and steel, with fire-resisting roofs, and are equipped to afford facilities to the civil and commercial field, something which few commercial airports at that time offered.

With public interest spurred by a number of memorable flights, the demand for adequate facilities grew and the Curtiss-

(*Continued on page* 60)

One of 50 Curtiss Hawks for China





Curtiss-Wright Osprey for South America

Personairlities

By Caldwell

● WILLIAM C. BROOKS, alias Whispering Bill, alias Wild Bill, the Loop King, alias Chief Flying Eagle of the Sioux Indians, is also known to his more intimate and insulting friends as Chief Hole-in-the-Face; but under any of these names the Police of the entire United States would have no difficulty in recognizing Bill Brooks, a quiet, scholarly looking gentleman who spends much of his time in a state of genial amusement at himself and this quaint world. Bill is one of the most amazing characters I have encountered; and I have foregathered with all sorts, shapes, sizes, and conditions of flying humanity, such as the Duke of York, General Billy Mitchell, Mayor La Guardia of New York, General Foulois, Emil Burgin, Ole Olson, and right down to Hiram Bingham, which is as low as I care to go. And of the lot, with all of their various peculiarities, the most peculiar and amusing is Bill Brooks. There is no one else even remotely like him, which is a pity, for he is a most entertaining character. Dickens might have written him. In fact, perhaps Dickens *did* write him; he may be Mr. Pickwick masquerading under another name.

Bill has the most startling sense of humor of any man I have encountered—and in aviation you meet some rather odd people, or the business wouldn't be what it is. He has a dozen albums filled with press notices and pictures of crashes, and with a little urging he will run through these for you, chuckling delightedly as he describes how near he came to being obliterated in this, that, and the other minor or major disaster. It just tickles him to death to recall numerous occasions which should have ended him, and didn't, for he has spent much of his life playing practical jokes on the Grim Reaper, and getting away with them.

For instance, at Allentown, Pa., in 1928, while Bill was flying along over the city in a J-1 Standard, at an altitude of around 1,500 feet, the prop let go and the Hisso catapulted itself out of the ship, leaving Bill and a passenger, Walter Harleman, to think things over at their leisure. Of course, losing some 700 pounds of engine, radiator, water, engine mounting, and fittings left the Standard somewhat non-plussed, or minus. So as it was now very tail heavy it fell back on the tail, did a series of whip stalls, straightening out momentarily, falling backward again, and finally hitting the ground with a rending crash, but fortunately at that moment in an almost level position. At the instant of impact it was traveling backward at about ten miles an hour, as near as Bill could reckon. It lit right in front of the car barns in Allentown, near the center of the city. One of the crowd that collected remarked sympathetically, "Boy, I once got my car stuck in reverse like that, and couldn't do nothing about it, either." Something like that often happened to Bill.

Bill was born, as a good joke on his parents, Oct. 11, 1893, on his father's homestead near Alliance, Nebraska. In 1907 he entered and joked his way through Lincoln Military Academy, and in 1917 joined the United States Army, after which the joke was largely on him. But he took it all good naturedly, started at nothing flat, and ended as a flying instructor with a second lieutenant's commission. Two years in the Army made Bill so dizzy that right after he got out in 1919 he took up a Spad and established a world's record of 237 consecutive loops, and a world's altitude record of 27,500 feet, both of which stood for over a year, while Bill was barnstorming around in Jennies and Standards, enjoying fat and lean years, but mostly the latter.

Crew of the proposed trade flight to Russia—Brooks, Alexander, Finch and Fitkalo

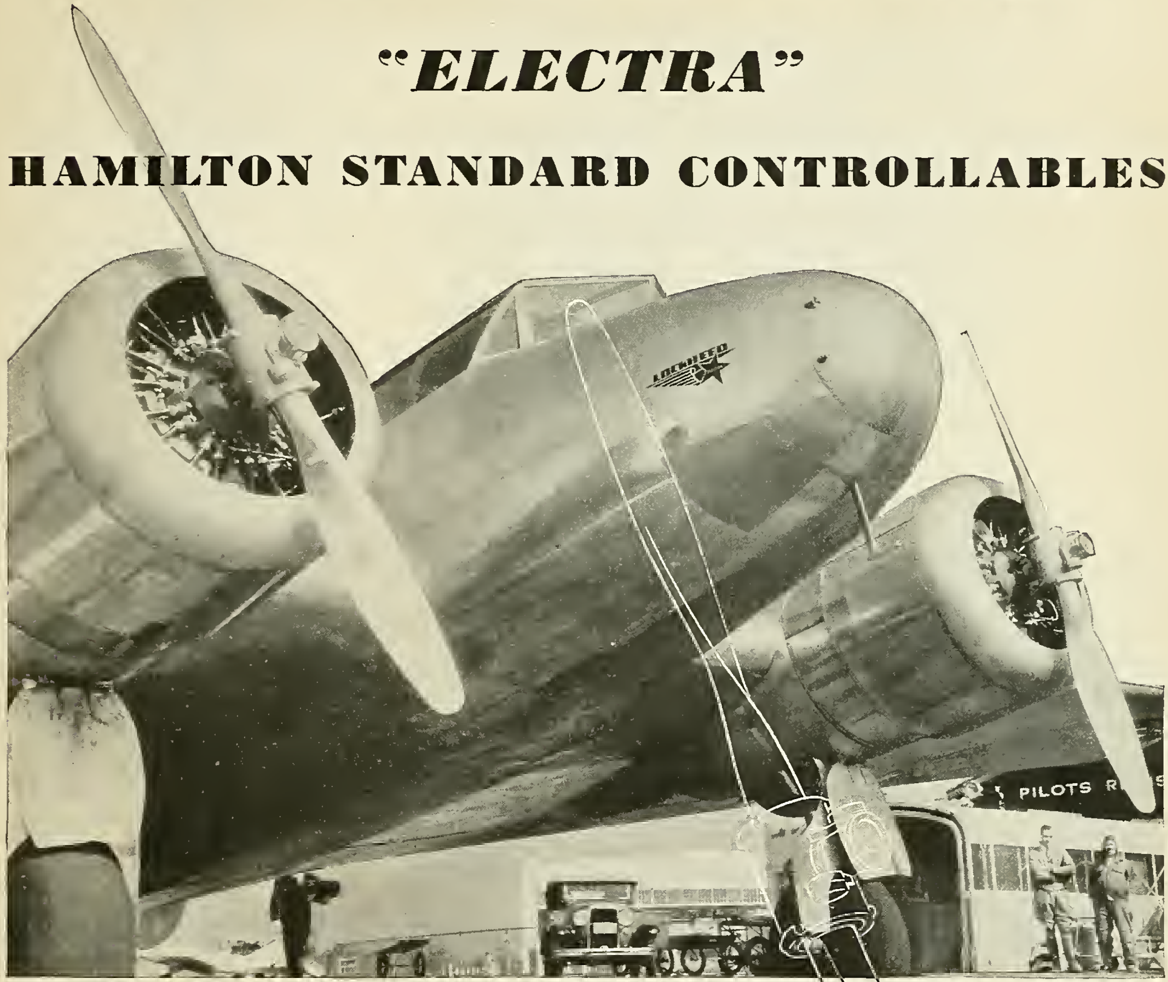
In 1920 he landed the first airplane in Yellowstone Park, on the bank of a lake 8,000 feet above sea level. It was nearly above the Standard's flying level, too, for when Bill took off on the return trip the plane sogged along, looked this way and that, as though surprised to find itself up there, and then fell into the lake. Bill fished it out, and found that it was full of trout that hadn't been able to swim out through the wires. Bill took out the engine and used the Standard as a fish net—only the little fish managed to wriggle through the struts. When he'd got all the fish he wanted, he put the engine back in, waited for a strong breeze, and then flew it off, like a kite. The good old Standard! It was designed by a grandson of the fellow who invented the hoop skirt; he believed in wires everywhere, and a bustle where needed. Two Frenchmen just discovered the lost city where the Queen of Sheba lived when she got back home after fooling around with King Solomon; it's in the Arabian Desert, and when the archeologists dig it out they'll like enough come across a couple of old Standards buried in the sand.

Let's see—where were we? Well, this old Bill was wandering around, when he collected a new name, Chief Flying Eagle. It was in 1922 when he was on a tour of South Dakota that the 8-year-old grandson of Chief Sitting Hawk of the Spearfish Sioux Indian tribe was bitten by a rattlesnake. Bill put the boy in the plane and flew him to Omaha, where a famous surgeon treated the wound and saved the lad. In gratitude, Sitting Hawk created Brooks a real Chief among the Sioux, giving him the name of Flying Eagle, which his friends later shortened to Chief Hole-in-the-Face, in memory of the way in which Bill could pour rye into himself. That second ceremony lasted three days, until all the liquor was gone, most of it into Chief Hole-in-the-Face. This old Indian, by adoption and absorption, took aerial motion pictures of Yellowstone Park for Fox Films, and later starred in several Fox pictures, including "Nan of the Northland." But Bill really wasn't the type for pictures; he didn't look like Clark Gable and he couldn't croon. The best press notice he got was

(*Continued on following page*)

SELECTED *for* LOCKHEED'S "*ELECTRA*"

HAMILTON STANDARD CONTROLLABLES



With performance far exceeding the designers' expectations, the new Lockheed Electra in recent test flights established a top speed of 221 miles per hour at 5,000 feet and a cruising speed of 203 miles per hour at 10,500 feet. Hamilton Standard is justly proud of the contribution its controllable pitch propellers have made toward this remarkable performance.

HAMILTON STANDARD
EAST HARTFORD CONNECTICUT
SUBSIDIARY OF UNITED AIRCRAFT & TRANSPORT CORPORATION
PROPELLER COMPANY

● *In addition to the Electra, other transports using Hamilton Standard Controllables include the following:* Boeing Monomail, 247 and 247-D · Consolidated Fleetster · Curtiss-Wright Condor · Dornier Landplane · Douglas Airliner · Fairchild Super 71 · Fokker F8, F12, F18, F22 and F36 · Ford Trimotor and Ford Freighter · General Aviation GA43 · Heinkel HE70 · Junkers JU52 and JU60 · Lockheed Orion and Electra · Northrop Alpha, Gamma and Delta · Sikorsky S-38 and S-42 · Vultee V-1

HAMILTON STANDARD

CONTROLLABLE PITCH PROPELLERS

(Continued from preceding page)
a critic's admission that the audience forgave him.

One fall day in 1923 Bill was flying his speedy Standard at a low altitude over the country near Alliance, Nebraska, when his motor cut out and he landed in a school yard. Before he could get away again, the school teacher came out and married him. Well, maybe it wasn't that fast—I like to be accurate. The lady was Miss Naomi Moxon, and a month later they were married in an airplane flying 4,000 feet above Alliance. Let that be a lesson to young pilots not to fly low near school houses in the country; teaching a country school makes a girl so desperate she'll even marry a pilot.

About this time Brooks joined the Gates Flying Circus, which is a story in itself, and was with Gates, except for several intervals, until 1929, when the circus disbanded. Clyde Pangborn and Bill were the first pilots, and Milton Girton was the first mechanic and wing walker. Once they were playing St. Louis and the crowd didn't come out, so Brooks, with Girton standing on the upper wing of a Standard, started at 1,000 feet over the center of St. Louis and looped four times, coming out just above the roofs. "If they won't come out, we'll *scare* 'em out," said Wild Bill, and he did. After two years, he became manager, and with the circus toured every town in the United States over 10,000 population.

During parts of 1925 and '26 Bill left the circus and flew mail between New Orleans and Pilottown, La., but that was too tame for him, so in 1927 at the request of President Diaz he and the late Lee Mason formed the Nicaraguan Air Force. It was a very powerful Force, consisting of three Swallows, one with a Hisso and two with the powerful OXX-6. Mason and Brooks were made Majors. President Diaz always knew where to find his entire Air Force at a moment's notice; he'd just drop into a nearby saloon, and there it was, with its feet on a table. Occasionally the Force went up and dropped a few home-made bombs in the vicinity of an interesting chap named Sandino, whom the Marines couldn't hit, either; and then the Force returned to the saloon, crying, "Waiter, two gin fizzes." It was a perfect war. Once Bill incautiously went out with 300 men (on the ground, not in the Swallow) and met Sandino, with 1,200 men. He'd just as soon not have met him. When Bill got back to headquarters (in the pub) all he had left was 78 men.

In 1929 Brooks became manager of Holmes Airport, until a windstorm blew half of it away and the Depression accounted for the rest. He is now waiting to go as co-pilot with Bill Alexander on the Recognition Trade Flight from New York to Moscow via Bermuda and the Azores, some time this summer. But more about that at the proper time. The people of the Union of Soviet Socialist Republics will find Bill Brooks a very amiable unofficial good will ambassador.

◆

• DOWN ON THE rockbound coast of Maine they raise a type of human that is becoming scarcer every year—the type who doesn't talk much about anything and won't talk about himself at all. W. H. Alexander is a good sample. The only way you can get any information out of Bill is by blasting. And then you only chip off a few rocky hard facts, without frills. They must make those Maine men out of granite. They're the strong silent type. It may come from eating potatoes and staying out in the open during freezing winters. If they all came like Bill, each of these biographies I write would run about two paragraphs, and I'd have to pad the copy to make it fill a page. I have to, anyhow, most of the time.

Bill and I once spent six months working for the same company, back in 1926, but we never met until the last air races in Cleveland, when Bill was there with that very fine pilot and fistic expert, the late Young Stribling.

Bill and I met the other night at Bill Zelcer's White Horse Inn in New York and had a little session with a few of the boys and some brandy. Of course, I'm old now, and I can have sessions; but I don't recommend them, except for us old-timers, for they wear you down.

Well, as I was saying, Bill Alexander was born in Presque Isle, in the strong silent state of Maine, away back in 1887, on July 7, to be exact, as I always like to be, for no sensible reason. For his education he went to the great city of Houlton, Maine, where they taught him to learn everything and say nothing, a system which has made Maine what it is today. By the way, what *is* Maine today—Democratic or Republican?

Bill did his first flying with F. J. Terrell in an old Curtiss Pusher in 1909 and qualified for his Aero Club License in December, 1911. That makes him an Early Bird. And the early bird gets the worm, and that's about all it gets him. Bill went barnstorming New England and the Southeast in summers and selling automobiles in winters during 1912 and on to 1914. Then there is a hiatus in his life, which I don't seem to have here on my notes. Possibly he just dug potatoes for the next three years, or else I missed something in my notes at the White Horse, for the next record I have of him, in a wavering hand, written at 2 a. m., is that he joined the U. S. Navy as instructor on April 6, 1917, and spent the next year at Pensacola. He played around with the Navy for years at nearly every Naval Station they had, instructing on big boats, went to sea on West Indian and South American cruises, went through Massachusetts Institute of Technology, and generally enjoyed himself at the taxpayers' expense, like a farmer does these days. Then he stopped eating free on Uncle Sam and went to work for Aeromarine as test pilot in 1923, stayed there a year, and then flew the first big boat that ever smacked the Great Lakes hard, and flew between Detroit and Cleveland that summer on the old Aeromarine Line—the same course I flew in 1929 for Thompson, carrying mostly bootleggers between those two cities. Then in 1925 Bill took three flying boats to Maine and with his assistants barnstormed Northern New England, and went to Florida in 1926. The next year Bill and I worked for the same company, he in Florida, I up and down the east coast of the United States. It was the old Boston Airport Company, and we were supposed to be selling Travel Airs for it. It was mostly a supposition. Well, we did sell a few, and established some agencies, but we're not bragging. The firm never boasts that Bill and I once worked for it.

About then Bill got a school complex and established fields and ran schools and so forth in Brunswick, Ga., Waycross, and other distressing places. Then he came north in 1929 and flew for Colonial between New York and Albany. That was like running an elevator, only you go horizontal instead of vertical. It got so stale that in 1930 Bill piloted the first airplane to fly from New York to Bermuda on April 1 (which is April Fool's Day, in case Bill didn't notice). But he got over that and flew on the Atlantic Coast Airways in the summer of 1931. Next year he became a sort of aerial butler to the Lambert family, and in 1933 he went to Nome to rescue Jimmy Mattern, whom the Soviet Government had rescued before Bill quite got there. But he flew him back after the Russians kindly delivered Jimmy, who, the last I heard of him, was playing the College Inn, Chicago, in an act called "Perilous Moments."

Well, that was the last sensational thing that Bill Alexander did. If this sketch of him seems a bit mixed up, blame it on the White Horse Inn. If you want to interview a pilot, and get his history all jumbled up, meet him at the White Horse and keep on with brandy and the interview. The results will surprise you. Sitting out here at Fallen Arches, my country estate, and trying to decipher what I wrote the other night, has proved an engrossing, not to say an unnerving pastime. What I wanted to say was that Bill Alexander is Chief Pilot of the Recognition Trade Flight to Russia, the same one of which Bill Brooks is co-pilot. If the Russians can get anything out of Bill, they speak his language better than I do.

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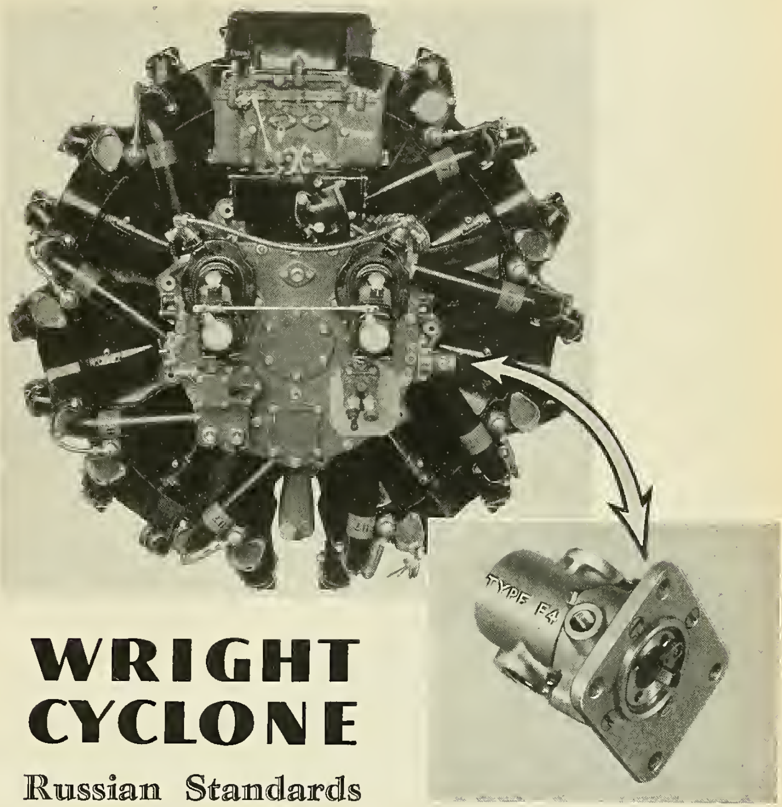

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PRIVATE FLYING and CLUB NEWS

Detroit Glider Unit Formed

WITH THREE active clubs already on its roster and two others ready to join, the Detroit Glider Council was recently organized under the presidency of Arthur Schultz with Ralph C. Conlan, secretary.

The organization has proposed a number of plans which it hopes to carry through to completion, included among which is the securing of the use of a number of airports for gliding operations, staging of a number of local glider contests, organization of more clubs and coordinating the glider adherents in the Detroit area to foster anything which will be beneficial to gliding. In addition, the Council plans to secure substantial recognition for gliding as a vital factor in civilian flying.

Airport Aviation Club Planned

POPULARITY OF airports as community or recreational centers is expected to grow as a result of the development of The Aviation Club at Holmes Airport, Jackson Heights, Long Island, New York, by E. H. Holmes, field founder.

According to present plans the club will offer dining and dancing, year-round swimming, tennis, squash, and handball. Last year a beer garden and a race track were built on the field and with indications pointing to increased patronage, contracts were let for a larger automobile race track and grandstand facilities. Also, actual work of laying water mains to supply the swimming pools has begun.

Holmes feels that, although flying is the principal function of an airport, every other facility to entertain and amuse the visitor should be used. The organization of the Aviation Club of the City of New York has gone forward with this plan in mind.

Turner Out for Speed Mark

AN ATTEMPT to lower the land plane record over a three-kilometer course will be made by Roscoe Turner during the early spring at the Wayne County Airport, Detroit, Mich.

Jimmie Wedell holds the present record at 304.98 m.p.h., while Turner established both the east-west and west-east transcontinental marks.

National Club Chain Organizing

THE UNIVERSITY of Minnesota Flying Club, winner of second place in the Loening Competition of 1933, is attempting to create a national organization of flying and glider clubs and already has received reports from some 250 colleges indicating that there is a need and a desire for such an organization.

A tentative constitution is now being formed and the organization aims to foster collegiate aviation, to stimulate interest in coordinate flying activities and to promote the mutual education welfare of the members.

At present there are a great number of collegiate flying, glider and model builders' clubs which have no common bond and can not therefore, profit by their mutual experience. The formation of a national organization, it is felt, will bring these smaller organizations into closer harmony with one another and result in a greater stimulus to flying and aviation generally.

ELMIRA GLIDER MEET DATES ARE SET

THE FIFTH Annual National Soaring Contest will be held at Elmira, N. Y., from June 23 to July 8, inclusive, with the contest open to sailplanes and gliders licensed by the Department of Commerce. According to the Soaring Society of America, indications point to an event which will be the largest and most productive yet held. Another gliding and soaring contest will be held from September 15 to 30, inclusive, at Big Meadows, in the Shenandoah National Park.

First Lady Flies to Porto Rico

SEEKING FIRST-HAND knowledge of the economic conditions in the West Indies, Mrs. Franklin D. Roosevelt and her party flew from Miami to San Juan, Porto Rico, in a Sikorsky Clipper operated by Pan American Airways.

Pilots Form Club

A RHODE ISLAND Pilots' Association has been formed at the State Airport, Hillsgrove, R. I., by a group of almost 100 pilots, their wives and sweethearts, who plan to promote aviation and foster sociability.

Leroy Gardner has been named president; August Becker, secretary-treasurer, and Allen Bourdon, Mel Holbrook and E. W. Wiggins, executive committeemen.

Radio-Plane Unity for Policing

AIR POLICE patrols will be linked with police cars on a nation-wide shortwave radio system to prevent crime and apprehend criminals if a plan laid before the Department of Justice by United States Marshal J. J. Murphy of Boston, is approved.

The idea calls for the creation of a service combining national, state and municipal police and investigation units. Under the radio unification system a message would be relayed to the aircraft, which, in turn, would guide the ground forces. New England is expected soon to be placed under such a system with the police planes based at the Boston airport.

Racing Pilots to Organize

AS A RESULT of meetings held in New Orleans by pilots participating in the Pan American Air Races, it was decided to form a professional racing pilots' chapter of the National Aeronautic Association.

An executive committee was chosen, three classes of membership were decided upon and the establishment of a recognized professional racing pilot license was recommended.

Topics discussed at the initial meetings included consolation races; qualifying methods; desirable hangar arrangements for racing planes; percentage of total prize money per displacement class; test flying of new type planes racing for the first time before transport to meets in which they are entered.

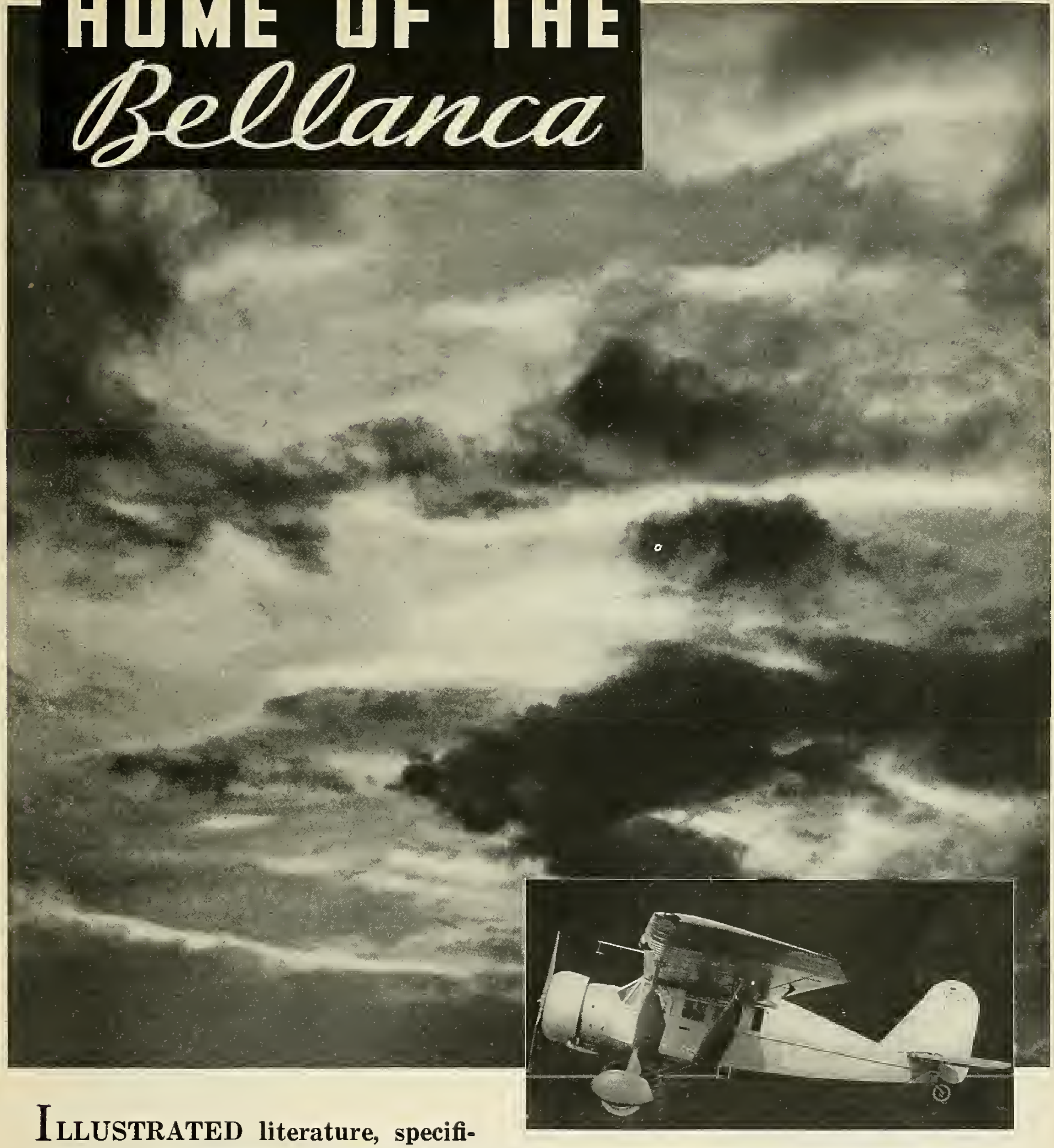
Under the subject of cooperation with race promoters, it was held that 14 days should be a minimum for advance notice of participation in a championship event and that participating pilots should arrive not later than three days in advance of the meet in order to assist the management in build-up publicity through radio programs, civic luncheons and the like. A penalty of $10 would be levied upon members disregarding this rule.

The three classes of membership decided upon include professional racing pilot members, racing plane owner members and technical members. The executive committee named includes T. H. "Doc" Kincaid, James H. Haizlip, Art Chester, S. J. Wittman, Lee Miles and W. R. Enyart. Kincaid was selected chairman and Enyart secretary.

Candidates named as charter members include Jimmie Wedell, Art Davis, Lee Gelbach, Harold Neuman, Art Chester, Gordon Isreal, S. J. Wittman, Roy Minor, Jimmie Doolittle, John Livingston, Roger Don Rae, Ben Howard, Roscoe Turner, Geo. Hague, Ray Moore, Russell Thaw, Bob Hall, Russell Hosler, Jack Wright, Joe Jackson, Art Carnahan, Ralph Bushey, Lee Miles, Jimmie Haizlip, Marcellus King and Bill Ong. Racing plane owner charter members include Ed Isreal, Sam Howard, Chas. McGrew and R. A. Kling while W. R. Enyart, Steve O'Connor and Kincaid were chosen charter technical members.

Young Fliers Finish Tour

AFTER FLYING on an aerial jaunt over Mexico and Central America for the past three months, Robert Buck of Westfield, N. J., and Robert Nixon of New York City returned to the United States after a flight to Miami from Havana. Buck established a junior transcontinental speed record of 23 hours 47 minutes between Los Angeles and New York in October, 1930.



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. AIRLINES and AIR TRAVEL .

Airline Extended Into Canada

AN INTERNATIONAL airline, linking Boston and six other New England cities with Montreal by daily air passenger service, has been inaugurated by Boston-Maine-Central Vermont Airways, subsidiary of the Boston and Maine, the Central Vermont and the Maine Central railroads.

Flying time between Boston and Montreal is 3 hours 15 minutes and 3 hours between Montreal and Boston. Stops are made at Manchester and Concord, N. H., and at White River Jct., Montpelier-Barre and Burlington, Vt.

Ships are 10-passenger, heated and radio-equipped tri-motored monoplanes which at present are maintaining a single round-trip daily. Planes leave Boston at 3:00 p. m. and arrive in Montreal at 6:05 p. m., while departures are made from St. Hubert Airport, Montreal at 8:00 a. m., with arrival in Boston at 11:00 a. m. Fares between Boston and Montreal are $16.50 one way and $30 round trip.

L. F. Whittemore, vice-president, stated that with the advent of the spring and summer schedules, the service in all probability will include an additional round-trip daily.

Airline Plans to Resume Flights

SIERRA AIRWAYS will probably resume operations in the very near future, if plans of R. R. Sterling, manager, and S. L. Shoemaker, pilot and instructor, materialize. The men plan to headquarter at Lone Pine, Calif., and will engage primarily in passenger pleasure flights around the Mount Whitney and Death Valley districts. Mr. Shoemaker will also supervise an instruction department.

Frisco Express Office Opens

RECENT OPENING of an office to handle local air express by the Railway Express Agency provides local manufacturers and merchants in south San Francisco, Calif., with a considerably expedited service, cutting from one to two hours from previous schedules to and from this city.

Allan Lockheed and Frank Clarke in front of the new Menasco-powered Alcor

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PASSENGER FARES COST 6 1/10 CENTS PER MILE

AIR PASSENGERS were paying for transportation at an average rate of 6 1/10 cents per mile on domestic airlines at the close of 1933, according to a survey by the Aeronautics Branch of the Department of Commerce. They made flights averaging 367 miles in length. The domestic lines had 102,544 flights scheduled during the year and completed 97,978, or 95 per cent of the total scheduled.

28,170 Passengers Fly in January

ACCORDING TO the Aeronautics Branch of the Department of Commerce, 28,170 passengers were carried in January, 1934, by 24 scheduled air transport lines operating in continental United States.

These scheduled airlines flew 3,439,451 miles, carried 155,726 pounds of express and flew 10,783,454 passenger miles.

New Coast Line Proposed

REGULAR DAILY service is to be scheduled between San Francisco and Eureka, Calif., if a proposal by Leslie H. Bowman, representing Capitol Speed Lines, Inc., is carried out.

The tentative schedule calls for one trip per day for passengers and express with Lockheed planes leaving San Francisco and arriving at Redding where passengers would be transferred to a Waco cabin plane for the balance of the trip to Eureka. A three and a half hour flight between the two points is considered.

United Eliminates Division

SERVICE FROM Omaha to Sioux City, Sioux Falls and Watertown, the 230-mile spur north of the midcontinent coast-to-coast airway, was discontinued by United Air Lines and equipment and personnel absorbed on other company divisions. This is the only reduction of route mileage made by the company and a check of its schedules in mid-March revealed that its planes were flying 37,606 miles daily.

No reduction of personnel has been made by the company with approximately 1,450 employees being maintained on the payroll.

Boston-New York Time Lowered

INAUGURATION of a de luxe express passenger service, shortening flying time between Boston and New York City by 35 minutes has been announced by Lester D. Seymour, president of American Airways.

Fifteen-passenger Cyclone-powered Curtiss Condor transports with two pilots and a stewardess, bring the two cities within an hour and a half of each other. For the present, the express service will feature but two of the five regular schedules now flown. The Condors leave Boston at 12:45 and 5:30 p. m. daily and the first plane out of Newark departs at 8:30 a. m., with the second leaving at 3:30 p. m. The three other daily, except Sunday, west-bound schedules, maintaining customary stops at Hartford, leave Boston at 8:00 a. m., 2:45 and 6:45 p. m., with Hartford stops at 8:55 a. m., 3:40 and at 7:40 p. m. From Newark, planes depart at 11:30 a. m., 5:30 and 7:30 p. m. with Hartford stops at 12:30, 6:30 and 8:30 p. m. The Sunday schedule consists of two express trips in each direction and the regular 6:45 and 7:30 p. m. departures from Boston and Newark respectively.

Short Line Plans Expansion

CHESAPEAKE AIR Ferries, Inc., operating a passenger and express airline between Easton and Baltimore, Md., has just purchased another Stinson Junior and is making plans to extend service in the spring to include Cambridge and Salisbury.

New Alcor Successfully Flown

THE ALCOR, new twin-engined cabin monoplane designed by Allan Lockheed for feeder-line work, was successfully test flown at the Alhambra, Calif., airport recently.

A somewhat unconventional nose section features the appearance of the ship with Menasco engines mounted on their sides and hooded by a streamlined cowling which fairs into the fuselage.

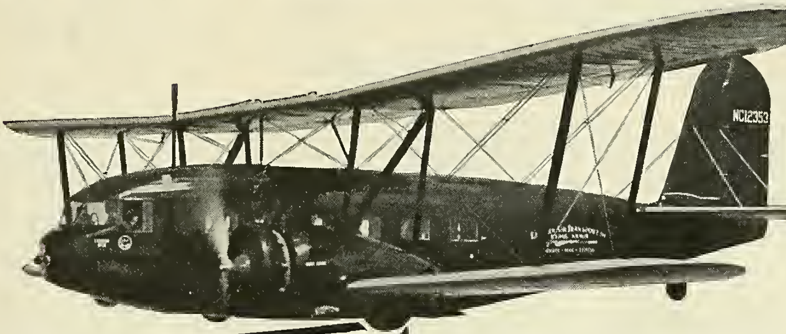
Pilot Frank Clarke was at the controls of the new ship with Al Menasco, builder of the engines used, Art Goebel and Lockheed witnessing the flights.

Short Feeder Line Considered

APPLICATION FOR a certificate of public convenience and necessity has been made to the Arizona Corporation Commission by Charles Mayse, pilot who desires authority to operate an airline and express service between Tucson and Nogales. Mayse plans to meet planes coming from Mexico which arrive on Tuesday, Friday and Sunday, and fly them to destinations off the established lines in a four-place Stinson monoplane.

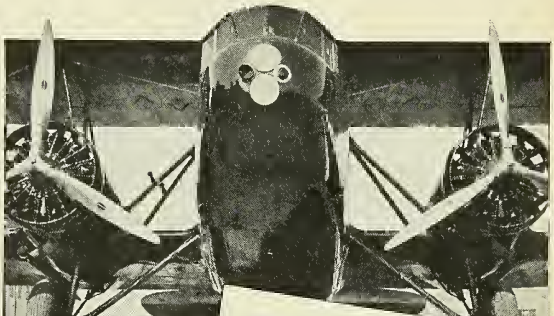
(Continued on following page)

SILENT PULLMANS OF THE AIR



Giant Curtiss Condor in Flight

NEW CURTISS CONDOR PLANES EQUIPPED WITH GOODRICH LOW PRESSURE TIRES for safe take-offs and cushion landings



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See your nearest Goodrich Dealer now, or write Dept. 359, Aeronautical Division of the B. F. Goodrich Rubber Co., Akron, Ohio, for complete information about Goodrich Airplane Products.

R. S. DAMON

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(Continued from preceding page)

Airlines Carry Peak Traffic

AIR TRAVEL over American-operated airlines, both domestic and foreign extensions, during the calendar year 1933 reached new heights when 568,940 passengers, an increase of about 28,000 over the previous year, were flown. According to the Department of Commerce, air express also increased appreciably during the year, while air mail was slightly less than in 1932.

Of the total number of passengers carried, 493,141 traveled on the domestic airlines and 75,799 flew on foreign extensions to Latin America and Canada.

Air express amounted to 2,452,812 pounds, 942,597 of which was on foreign extensions, a gain over the 1,600,821 pounds carried during 1932.

Air mail on domestic and foreign routes totaled 7,816,532 pounds as against 7,908,723 pounds in 1932. Of the total, 454,352 pounds were flown over foreign extensions.

The survey also revealed that 504 airplanes were in operation on the scheduled airlines at the end of the year and that these aircraft consumed 26,326,796 gallons of gas and 924,411 gallons of oil during 1933. Employment for 6,273 persons was furnished by the lines; 543 are pilots, 206 co-pilots, 2,320 mechanics and ground crew men, 1,834 other hangar and field personnel and 1,370 operations and office personnel.

Express Development Emphasized

A PROGRAM calling for extensive advertising, direct mail solicitation and redoubled efforts to increase air express volume originating at points along its routes, has been launched by United Air Lines, with the company's traffic department aggressively campaigning to develop new fields for air express as well as to increase shipments of the type which were carried in the past.

Material increases in volume of air express have been reported recently at New York, Chicago, San Francisco, Kansas City, Los Angeles, Cleveland and other division points. A survey of Chicago revealed that during the second week of March approximately 650 shipments, totaling nearly two tons, originated there, an increase over the first week of the month and a gain of 150 per cent over the corresponding week of 1933.

The company, one of several affiliated with the Air Express Division of the Railway Express Agency, has decided to supplement the ground pick-up and delivery service of the express agency by designating all of its traffic offices as receiving points for air express shipments.

SPEED MARKS MADE BY UNITED AIR LINES' PILOTS

SEVERAL transport plane speed records on various divisions of United Air Lines were materially bettered during recent weeks, but the fastest flying time ever recorded in a passenger-express multi-motored transport was an average of 270 miles an hour recorded by Pilot Werner Bunge on a 90-mile stretch of the coast-to-coast airway between Salt Lake City and Cheyenne. His Boeing 247 carried eight passengers and express.

Varney Forms New Company

FOLLOWING THE announcement that his company has signed a two-year contract with the Mexican Post Office Department to carry mail and passengers from Tapachula, Guatemala, via Mexico City and Mazatlan to Los Angeles, Walter T. Varney reported the formation of Lineas Areas Occidentals to carry out the terms of the contract.

Arturo Cubillias of Mexico City is president, while Varney, Donald Cardiff and Franklin Rose of San Francisco; Francisco Elias, Vejar Vasquez, Carlos Ramos and Antonio Saldana of Mexico City are directors.

The Mexican Post Office has designed the 1750-mile route between Los Angeles and Guatemala as Route No. 1. It follows the Colorado Desert from Los Angeles to Mexicali, then to Nogales, Los Mochis, Mazatlan, Guadalajara and Morelia to Mexico City. At a later date the planes will continue to Tapachula on the Guatemala border. Present plans call for three schedules each way each week with the one-way flight requiring 10 hours.

New Montana Air Service

GLASGOW AND Havre, Montana, are now connected by regular airline service, opened by George Brown, Great Falls, Mont., pilot, who is operating a chain of schools in addition to his airline. He also plans to inaugurate charter trips from Great Falls to these points and to other towns in the vicinity.

Pilgrim Converted Into Freighter

REMODELED Pilgrim monoplanes have been placed in regular service by American Airways to carry bulk shipments between Chicago, Detroit, Buffalo and New York.

Seats have been removed enabling the planes to be piled high with merchandise which must be delivered in the four metropolitan centers en route before the start of the next business day. At each city, uniformed messengers and fast delivery cars await arrival of the plane to speed shipments to consignees.

Departures are planned to accommodate late shipments from any part of Chicago or New York, while from Detroit and Buffalo they are scheduled, in both directions, well after midnight providing next morning delivery of shipments consigned almost any time before 12 o'clock.

Leaving Chicago at 10 p. m., the east-bound plane arrives in Detroit at 1:29 a. m. (E. S. T.), Buffalo at 3:47 a. m. and Newark at 6:36 a. m. West-bound, the Pilgrim leaves Newark at 10 p. m., arriving at Buffalo at 1:01 a. m., Detroit at 3:37 a. m. and Chicago at 5:36 a. m. (C. T.)

Pacific Coast Service Extended

TO ACCOMMODATE increasing coast-wise traffic from San Diego, a San Francisco-Los Angeles shuttle schedule was extended southward to San Diego by United Air Lines. Leaving San Diego at 2:50 p. m., the Boeing transport reaches San Francisco at 6:45 p. m. The south-bound schedule departs from San Francisco at 4:30 p. m. and arrives at San Diego at 8:09 p. m.

Northern Route to Continue

FOLLOWING CANCELLATION of the air mail contracts, Northwest Airways decided to suspend part of its service, but upon urgent requests for the resumption of the newly-inaugurated service over the northern transcontinental route from Chicago to the Puget Sound, Croil Hunter, general manager of the company, announced that the company will continue this service and in addition to the present schedules from Chicago to Billings, extend its run from Billings into Spokane, Seattle and Tacoma.

New twin-engined Lockheed Electras have been purchased to fly this route and their operations will decrease the time from Chicago to the west coast by a considerable number of hours.

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Estimating Control Surface Hinge Moments for Unbalanced Controls

●

ARTHUR G. B. METCALF

● A knowledge of the force which the pilot will have to exert in operating the controls of an airplane is of importance to the designer in laying out satisfactory control systems. One factor which offers difficulty in the calculation of this force is determination of the moment about the hinge axis due to the aerodynamic force set up by the angular displacement of the control surface.

Wind tunnel tests of models of particular designs in which the measurement of control surface hinge moments was included have not been considered part of a routine model test, for control surfaces on the conventional model are too small from a practical standpoint, and the measurement of hinge moment entails considerable additional trouble in setting up the apparatus necessary to measure the small force involved.

Therefore, in most cases the procedure has been to include in the flight test the determination of the correct control gearing, found by making adjustable some part of the system (generally the control horn) and adopting that setting which gave the desired "feel" at the control column. While this procedure has much in its favor, at best it will only take care of small changes in the gearing without seriously limiting the travel of the control surface, thus necessitating an entire redesign of the system. Furthermore, in the present state of the art when many important characteristics of the airplane are determined on the flying field, it is desirable to have the airplane as nearly correct as possible on the initial test flights.

While it is possible to calculate hinge moments from the theory, it is not simple and is strictly only applicable to unusually small angular displacements of the surface.

It is the purpose of this article to offer briefly a simple means of estimating hinge moments of conventional flap-type controls, without balance, with an accuracy comparable to that of any estimation which might be made without resorting to test of a specific model. The method is based upon an analysis of hinge moment tests of three large models of the horizontal tail surfaces—test of a tail tapered in plan form, at the Eiffel Laboratory and designated as the S.P.C.A. 90, published in the "Bulletin de la Chambre Syndicale des Industries Aeronautiques," Volume IX, Number 6; test of a tail with raked elliptical tips (varying the elevator chord), at Göttingen and published in "Ergebnisse der Aerodynamischen Versuchsanstalt zu Göttingen, III"; and test of a tail tapered in plan form with two different sizes of elevator, at the Massachusetts Institute of Technology by the writer. All of these tails were of "average" dimensions and elevator areas.

The non-dimensional coefficient of hinge moment is:

$$C_H = \frac{H}{C_e\, S_e\, q}$$, where

C_H = non-dimensional coefficient of hinge moment
H = moment about the elevator hinge (foot pounds)
C_e = mean elevator chord (feet)
S_e = elevator area (square feet)
q = $\frac{1}{2} \rho V^2$

Tests show with accuracy sufficient for engineering purposes, that C_H is a linear function of both the elevator angle (β) and the angle of attack of the stabilizer (α), both expressed in degrees, for ele-

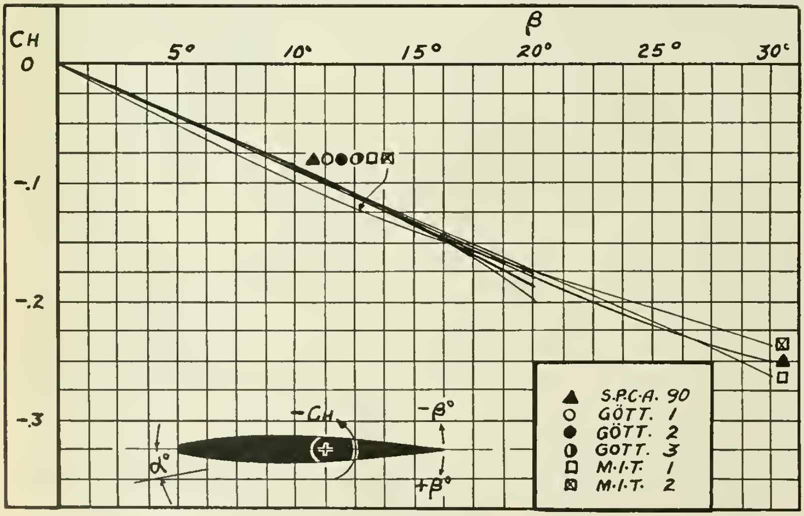


FIGURE 1

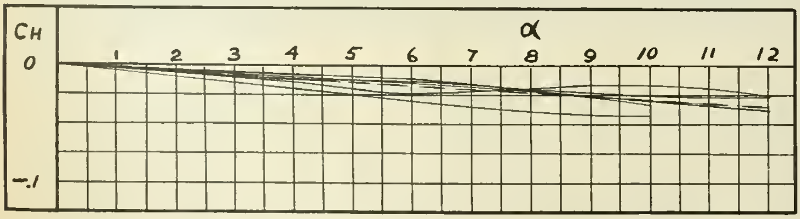


FIGURE 2

vator angles up to 30°, at least, and for values of α up to 12°, beyond which the tail stalls and the hinge moments increase rapidly.

Then for the un-stalled range, the expression for hinge moment may be:

$$C_H = C_1\,\alpha + C_2\,\beta \qquad (1)$$

where $C_1 = \dfrac{d\,C_H}{d\,\alpha}$ and $C_2 = \dfrac{d\,C_H}{d\,\beta}$, or the slopes of the plot of C_H against α and β, respectively.

Values of C_2 were determined from the above-mentioned tests. For the same angle of elevator setting (β), the coefficient C_H remained remarkably constant, being practically unaffected by wide variations in the ratio of flap chord to total chord, plan form and aspect ratio. Tests in which all of the above factors were varied are plotted in figure 1, which is a plot of C_H vs. β when $\alpha = 0$ and it is seen at once from the curves that the hinge moment coefficient C_H, for all practical purposes, depends only upon the angular setting of the movable surface or the angle of attack of the fixed surface ahead of it. A study of these tests, varying the angle of attack of the stabilizer (α) indicates that throughout the useful range of angular setting of both fixed and moveable surfaces the slope C_2 is substantially constant; the effect of varying α is merely to shift the plot of C_H vs. β parallel to itself, a distance, as measured vertically, equal to $C_1\alpha$.

Figure 2 is a plot of C_H vs. α, when $\beta = 0$, for the same models, it is seen that slope $\dfrac{d\,C_H}{d\,\alpha}$ (or C_1) is not nearly as constant as C_2, showing a scattering of points as the physical characteristics of the tail are varied. However, since the magnitude of C_1 is small in any case, for purposes of estimation, it is sufficiently close to draw a mean line through these points, the slope of which may be taken as C_1.

Evaluating these factors we have:

$$C_1 = -0.0030 \qquad C_2 = -0.0087$$

In the solution of equation (1) it should be pointed out that the angle of attack of the stabilizer (α) must be calculated, taking into consideration the downwash as well as the stabilizer setting; the expression for α taking the form:

$$\alpha = \alpha_w - \varepsilon + \alpha_o$$

where α_w = angle of attack of wing with respect to wing chord (deg.)

ε = angle of downwash (deg.)

α_o = angle of stabilizer setting with respect to wing chord (deg.)

The angle of downwash being calculated in the usual manner an exact determination of α is difficult due to the fact that the downwash at the tail can be calculated only approximately. However, as before, we can allow this approximation since $\dfrac{dC_H}{d\alpha}$ is small.

The final form of the expression becomes:

$$C_H = -0.0030\alpha + (-0.0087\beta)$$

(the convention of signs for C_H, α, and β as shown on the accompanying graph) From which the hinge moment is determined by the relation

$$H = C_H\, C_e\, S_e\, q$$

In most cases the accuracy of the hinge moment calculation when α is known exactly will be within 5% and in all cases within 10%. The effect of α being in error by as much as 20% does not become excessive except for small values of β (less than 10°).

In general the accuracy of the method as a whole is well within 15°.

Rudder hinge moments may also be estimated by use of this equation.

For tail surfaces of rectangular plan form, the slope C_2 should be multiplied by the factor 1.38. This factor is based upon a study of a large number of hinge moment tests of tail surfaces having this plan form.

Shielding the Radio on Private Airplanes

PAUL O'CONNOR

Chief Engineer, Westport, Mfg. Co.

● With the widespread use of radio receivers by private and commercial flyers to keep in touch with weather broadcasts and to ride the beam, it is most essential that aircraft engineers and mechanics become familiar with the fundamental requirements of a good radio installation. Different installations present their own problems which must be worked out as they are encountered, and if the shielding has been thoroughly and carefully installed, the results will justify the energy expended. For satisfactory radio reception, the shielding of the plane must be complete.

Of first importance is the elimination of radio-frequency disturbances generated by the ignition system of the engine and the static discharges of the various parts of the plane itself in flight. The high tension portion of the ignition system is the worst offender and must be given detailed consideration.

Numerous methods of suppressing disturbances of this character have been tried, but most of them have been discarded. The employment of so-called "spark suppressors" or resistors in the high tension leads, for instance, reduces radio interference, but at the same time lessens spark plug efficiency to a point where the engine output is cut down from 10% to 25%. Furthermore, resistors frequently fail due to extreme changes in temperature.

The only completely satisfactory solution to the problem of suppressing ignition noise is the complete shielding of the spark plugs and high tension wires. To accomplish this it is not sufficient merely to cover all parts of the ignition system with shielding material—the various component parts must be joined with mechanically solid connections.

Two methods are used for shielding the plugs. One is to encase the standard plug in a metallic housing, or spark plug shield such as those made by the Breeze Company. Such a shield is provided with a fitting for connection to the shielding of the magneto high tension cable. The other method is to use a "shielded spark" plug, such as the BG. In this plug, the "hot" electrode is completely encased in a metal sleeve, and it is used with a suitable elbow fitting for connection to the shielding of the high tension cable.

Choice between the two methods of shielding the plugs is primarily one of cost, the external shield type being less expensive.

Both methods involve the use of a spring between the spark plug terminal and the high tension lead. These springs must be inspected periodically and frequently to make sure they have not become annealed by heat. A weak spring will result in a poor contact and finally a complete disconnection. In the latter case, there would be danger of burning out the magneto coil because of the increased widening of the spark gap. It is most essential that no oil be permitted to accumulate in the shields.

Two methods of shielding the high tension wires from the magneto to spark plugs are employed. One is to completely enclose the wires in a metallic loom or cable, while the other is to use a shielded cable. In either case, the loom or cable must extend from the plugs to the magneto and be firmly grounded at both ends.

When shielded cable is used, it should be Packard No. 844 or equivalent. This cable consists of the regular 7 mm. high tension cable with an additional wrap of varnished cambric enclosed in copper braid, and an outer wrap of lacquered braid. Tools and ferrules for suitably

(*Continued on page 60*)

A Practical Method of Fuselage Fairing

DONALD DE LACKNER

●

● A half dozen designs back, the author found it necessary to devise some logical system of fuselage fairing which was accurate enough for monocoque structures and did not require measuring innumerable coordinates or the fitting together of various radii of different lengths, etc. The method evolved has for its basis nothing entirely new, but the combination has been found to be extremely satisfactory because, first, an absolute faire curve is obtained; second, a reproduction to any scale can be easily and accurately made; third, the method is easily learned by draftsmen, and does not depend upon artistic skill in the fitting of splines or ships curves; a sufficient number of points only, are necessary, and last the method has been successfully used and has proven to be a time saver.

Figure I shows the master chart for the complete fairing lines of a modern high-speed transport. This chart forms a complete record of the basic body lines, and is used directly to obtain sections at any fuselage station. Fuselage station numbers multiplied by 10 represent distances in inches from some vertical reference plane; in this case the C.L. of the propeller. Ordinates to the curves at any station represent distances in inches from some axis of symmetry as indicated by the particular curve where the ordinate is being measured.

Suppose it is desired to obtain a section through the body 280″ from the propeller C.L. It is necessary only to measure all ordinates to curves above No. 28, then referring to figure II, lay out these ordinates as shown. Ordinates to the cabin and bottom curves are laid out respectively above and below the thrust axis reference point. The ordinate from the plan curve is laid out horizontally from the thrust axis. Ordinates from the +H 26 and —H 24 are laid out horizontally from the axis of symmetry on planes respectively 26″ above the thrust axis and 24″ below the thrust axis (+being above and — below, "H" referring to a horizontal section). Using the five points laid out, the next step is to construct two conic sections through these points, the one above, the other below the thrust axis. The construction used is illustrated by using the top conic section curve as an example.

From point T draw a horizontal line intersecting at point A with a vertical line drawn from P. From point P draw a random fan of lines such as P I; P II, the first of which passes through the point on the +H 26 plane (which is a point on the section curve). Now pass a similar random fan of lines from point T, such as T VIII, T IX, etc., the first one passing through the point on +H 26. Next, from point A as a center and the intersection of line T VIII and P VII (point 7), draw a line intersecting P-I at 16. Revolve lines about A through points 7, 6, 5, 4, 3, 2, giving the intersection 16, 17, 18, 19, 20, 21. Then revolving a line from T as a center, through 16, 17, 18, 19, 20, 21, we get the intersections M, N, O, etc.,. Similarly revolving a line from P as a center through 22, 23, 24, 25, 26, 27, 28, we obtain the intersections Q, R, S, etc., which are points on the required curve which is a fuselage section at station No. 28.

Now for the method of arriving at the chart shown in figure I. The engine used determines approximately the size of the engine cowl. The cabin requirements give a general idea of the mid-ship size in three views, while the required tail length and landing angle fix the

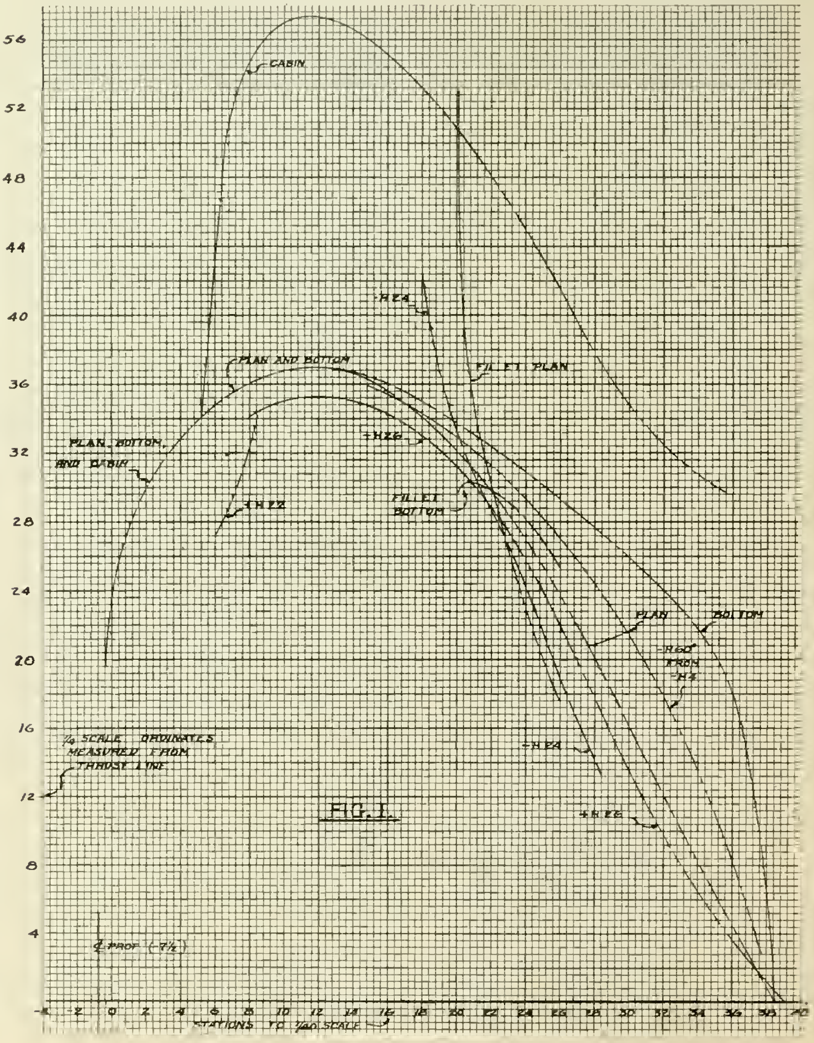


FIG. I.

length and limit the bottom line at the tail wheel. With the above limitations in mind, a rough three view is next laid down. An attempt is now made to fit an elliptical section around the plan view as follows: (see figure III). Multiply the body length (from extreme tail to front of engine cowl) by 1.15 which gives an approximation for an ellipse to enclose the body. Locating the maximum section at about 28% from the nose of this ellipse, gives a basis for a trial ellipse. Divide the major circle into any convenient number of equal arcs and drop perpendiculars from these points to the major axis. Equally divide the distance from the tail to the origin of the ellipse into the same number of parts as the major circle was divided, and erect perpendiculars. From where the major circle radii intersect the minor circle, project horizontal lines to intersect their respective perpendiculars from the major circle, giving the familiar ellipse. Now the same heights are laid off on corresponding perpendiculars on either side of the origin, giving a symmetrical shape. Several trials may be necessary; the cabin dimensions may need to be somewhat altered, or the symmetrical elliptical sections may have to be modified, by locating maximum sections forward or aft, as done in the example used for illustration (figure III).

The top contour and bottom contour are next drawn in the side elevation, being determined by engine cowl, cabin length and height, ground angle, wing placement, tail, and a general smooth blending. This is the point at which the chart of figure I is drawn, and becomes useful in showing up any irregularities in the curves chosen. It will be noted that ordinates on this chart are ten times as large as abscissa. This produces "bunched up" curves, whose direction changes rapidly in contrast to the long gradual curves of the original three view.

The next step is to choose several sections where definite dimensions should be held, such as engine cowl, front end of cabin, rear end of cabin, and rudder hinge line. Knowing the width, height above, and depth below the thrust line, it is a simple matter to sketch in approximate sections at these stations. Going back to the plan view, plan view curves can now be drawn from points on planes such as +H 26 and —H 24, intersecting these stations which have been sketched. These curves should be as similar as possible to the elliptical shape of the fuselage at its maximum width in plan view. Putting these curves on the chart of figure I will show up any irregularities which can then be corrected. Now the chart contains all the necessary fundamental curves to obtain sections at various stations, by the method already explained. As a check, it is good to pass several planes through as many sections as possible to check the fairing. This will be discussed later.

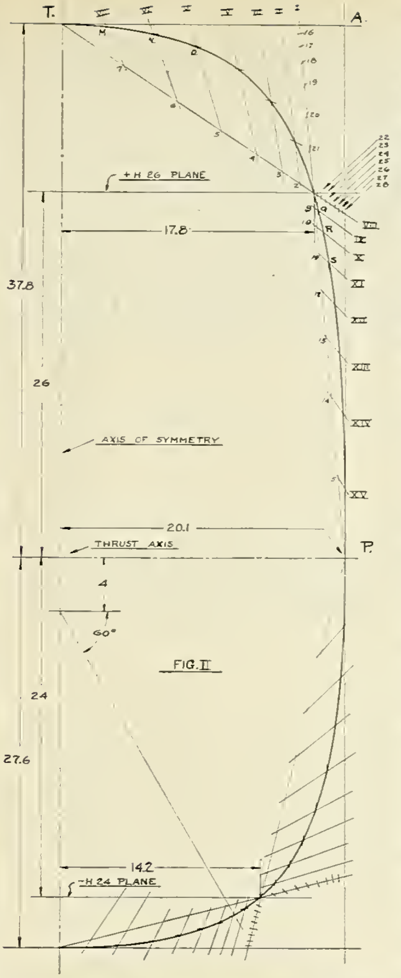


FIG. II

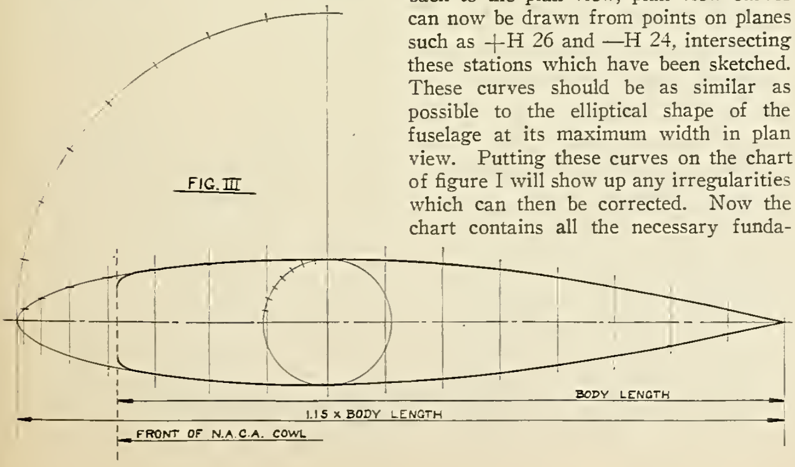


FIG. III

The windshield, wing fillets, tail intersections with fillets is next added to the basic fuselage shape. It has been found advantageous to build a model according to basic sections, then build on the fillets, etc., in plasticine when doing the wind-tunnel work. Changes are thus easily made, speed added to the ship and a physical object brought to aid the imagination of the harassed draftsman, who can take off actual scale templates of bothersome fillets, etc. These curves are then added to the master chart.

It will be noted that the master chart contains a curiously marked curve (—H 60° from —H 4). This denotes a curve of all points on a plane intersecting the plane of symmetry 4″ below the thrust axis, and 60° below the horizontal. The reason for so locating this plane is as follows: During the design of this particular plane, and after the fairing work was nearly completed, it was decided to move the engine 4″ above the original position. In order to preserve the fairing work already done, the —H 60° plane was kept where it was, and the thrust axis moved 4″ upward. For the sake of simplicity it would have been better to fair a new curve at some angle from the new thrust axis. The choice of a fairing plane 60° below the horizontal was determined by the desirability of having the third points, for the construction of the lower conic sections, located somewhere near points of maximum section curvature on sections at both the forward as well as the aft end of the body. The 60° plane might have been 50° or 70° or any other angle so long as it came near the points of minimum radii of curvature, on most sections. The (—H 60° from —H 4) plane is really a

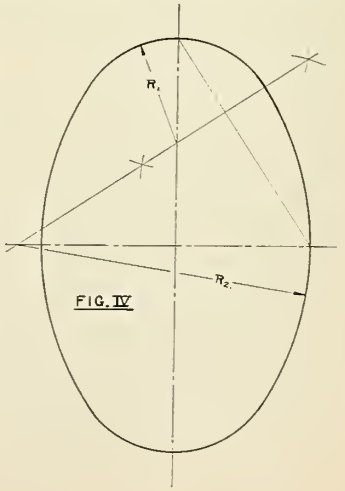


FIG. IV

basic fairing plane, the —H 24 plane merely replacing it where it was found desirable to give a little extra bulge to the fuselage, so as to have a better base to build on the wing fillet. It will be noted that there are five primary curves, the plan view curve, the top contour, the + H 26 and the—H 60° from—H 4 curve. The first three are self-explanatory, the fourth is a curve of all points at the intersection of a plane passing through the body 26″ above a horizontal reference plane (in this illustration, the thrust axis). It will be seen that the top conic section becomes tangent to the lines T A and P A at T and P, respectively. Since the bottom conic section also becomes tangent at P, the upper and lower sections merge together perfectly.

The above method can be modified to suit any type of ship, and practice soon shows one the many possibilities and innumerable variations. One simplified variation was used on a ship having a nearly symmetrical fuselage with remarkable success. The variation in this case was the substitution of the two circle ellipse method of developing the body sections (refer to figure IV). This could only be done because of the extreme simplicity of the body shape of this ship.

The two circle ellipse is developed as follows:

Subtract the length of minor axis from that of the major. Subtract the difference obtained, from a diagonal connecting the end of major and minor axis, beginning from the intersections of the diagonal with the minor axis. Erect a perpendicular bi-sector of the remainder of the diagonal which cuts both the major and minor axes. These intersections are centers for two circles which so intersect as to give an approximate ellipse.

Digest of Technical Articles from Foreign Publications

ELSA GARDNER

Magnesium Corrosion

The Corrosion of Magnesium Alloys, G. D. Bengough and L. Whitby. Aircraft Engineering, Vol. 6, No. 59, January, 1934, pp. 7-12, 21 figs., 20 tables.

AN IMPORTANT series of tests on atmospheric and sea-water corrosion of magnesium alloys is discussed with details of methods for protecting these metals. After dealing with the chemical results found in atmospheric corrosion tests, the authors take up the effect of corrosion on the mechanical properties of these alloys. The protection experiments described are concerned with the behavior of the alloys when sprayed with or immersed in sea water and four methods of producing films suitable for paint bases are specially studied, namely the panalumin or jirotka process, the alum-dichromate process of Sutton and LeBrocq, the I.G. chromate-dip and the authors' own selenium process.

Paper presented before the British Institution of Chemical Engineers.

Heat Treating Furnaces

Furnaces for Heat Treatment, W. A. Thain. Aircraft Engineering, Vol. 6, No. 59, January, 1934, pp. 13-19, 12 figs.

GENERAL REQUIREMENTS in furnaces of all types for aircraft factories are given. The author shows how an approximate estimate of the furnace capacity required for the factory may be made and quotes British Standard and Air Ministry Specifications for heat treatment of steel and aluminum. He devotes the remainder of the article to some of the general principles governing the development of the heat-treatment furnace and the working conditions which it has to satisfy. Mr. Thain's article is followed by detailed descriptions contributed by various British furnace manufacturers, under the titles of: Modern Gas-Fired Furnaces, Furnaces for the Nitriding Process, Electric Furnaces for Aluminum Alloys, and Self-Regulating Induction Furnaces.

Superchargers

Bench and Flight Tests of a Roots Type Aircraft-Engine Supercharger, by the Staff of the Engine Experimental Station, Royal Aircraft Establishment. (British) Aeronautical Research Committee—Reports and Memoranda No. 1558, September, 1933 (published March 1, 1934), 23 pp., 16 figs.

APPLICATION OF the Roots class of displacement supercharger to an aircraft engine was the purpose of this investigation and bench tests of a unit of this type, built to N. A. C. A. specification, were made to examine its performance characteristics. Subsequently, flight tests were undertaken to determine the capabilities of a Lion VS engine fitted with this type of supercharger.

The Roots supercharger was found to be especially suitable for engines with rated heights in the vicinity of 20,000 feet. At pressure ratios corresponding to altitudes of this order, a satisfactory volumetric efficiency was maintained and the adiabatic efficiency compared favorably with that of centrifugal superchargers. The power wasted below the rated altitude, by permitting a proportion of the compressed air to escape, was not excessive and, at ground level, the total power absorbed by the supercharger could be reduced to a negligible amount.

Engine Vibration

Torsional Resonance Characteristics of a Twelve-Cylinder Vee Aero Engine, B. C. Carter and N. S. Muir. (British) Aeronautical Research Committee—Reports and Memoranda No. 1304, February 2, 1933 (published March 1, 1934), 39 pp., 37 figs.

RESULTS OF torsiograph investigations in conjunction with frequency calculations and a consideration of minor criticals are described which were made on Service Liberty engines. A general analytical method of investigating damping in multi-crank engines is given which is applied to the engine to obtain damping factors for use in assessing the severity of important criticals in proposed designs for new engines.

Effects on the magnitude of the vibrations that would result from increasing the Vee angle from 45° to 60° have been examined and it was found that the forcing harmonic of the 4½ order critical would be 28 per cent less and that of the sixth order critical 41 per cent greater, while with an 80° Vee, the 4½ order critical would be zero. It was found that with the Liberty engine torsional vibrations can be considered as producing additional stress variations which increase in range towards the propeller end of the shaft where the single node occurs. Failure at the fifth crank from the free end is consistent with pronounced but not extreme single-node torsional vibration.

Buckling of Plates

Buckling of Thin Plates in Compression, H. L. Cox. (British) Aeronautical Research Committee—Reports and Memoranda No. 1554, August, 1933 (published March 1, 1934), 21 pp., 8 figs.

THE INFLUENCE of buckling on the strength of rectangular plane panels of thin sheet metal, subjected to compression parallel to one pair of edges, is investigated. Theoretical analysis of the behavior of panels both before and after buckling is developed and the results are compared with those of tests on panels with two different types of edge support. Experimental results provide reasonable confirmation of the relation between stress and strain as determined analytically.

Fuel Volatility

Fuel Volatility and Carburetter Freezing, W. C. Clothier. (British) Aeronautical Research Committee—Reports and Memoranda No. 1549, February 7, 1933 (Published October 30, 1933), 14 pp., 7 figs., 5 tables.

A SPRAY apparatus is described which provided a simple method of comparing fuels on a basis of their liability to promote freezing. A mixture of air and the fuel under test was sprayed on the bulb of a thermometer, so that temperature difference between the intake air and the spray temperature could be measured. The effect of the pressure and humidity of the intake air on the spray temperature was investigated.

Rocket Propulsion

Vertical Climb with Reaction Motors (Le escursioni in altezza col motore a reazione), A. Bartocci. L'Aerotecnica, Vol. 13, No. 12, December, 1934, pp. 1646-1666, 3 figs.

VERTICAL CLIMB by means of rocket propulsion is discussed and the supposition made that the ascent is effected by a uniformly-accelerated motion maintained by the rocket up to a given height, beyond which motion continues due to inertia so that a second given height is reached at zero speed. The descent is considered as a free fall down to a certain height, from which a uniformly-retared motion starts until the ground is reached at zero speed. The reactive force necessary to effect this motion is expressed as a resultant of the resistance of gravity and resistance of the air while formulas relative to the behavior of both ascending and descending motions and defining time in functions of the engine are established.

Variation of the mass in time is dealt with and some numerical examples are given to show the importance of a high speed for the exhaust gases. Some suggestions are made for taking into account the resistance of the air, although this acts for a short space only. The value to be adopted for the acceleration in ascent and descent is examined, taking account of both the resistance of the human body and the consumption of the explosive, and concluding from it the highest possible acceleration compatible with human endurance.

Ethyl in Aviation Fuels

Some Information on the Use and Advantages Gained by the Employment of Tetraethyl Lead in Fuels for Aviation Engines, F. R. Banks. Royal Aeronautical Society Preprint for Meeting, January 18, 1934, 18 figs.

AS COMPLETE information as possible is presented on the subject of a much discussed anti-knock material in order to dispel any misconceptions regarding the use and behavior of ethyl in gasoline for aircraft engines. The first part of the paper is devoted to the effects of fuel detonation and overheating, a comparison of benzol and ethyl fluid as anti-knock materials for aviation fuels, and the response of tetraethyl lead in various fuels. The second, and most important part of the paper, indicates the lines to follow in engine development in order to make full use of fuels containing lead. The author takes up the effects of the products of combustion of a leaded fuel upon the engine parts, dealing with the exhaust valves and valve-seat inserts in detail, and recommending suitable materials and combinations, with notes on valve and insert design, construction and fitting. He points out how cold corrosion may be avoided and gives some notes on the application of stelliting to valves and inserts of aviation engines.

(*Continued on page* 54)

New 145 h.p. Warner Monocoupe

● Refinements and improvements built into the new high-wing Warner 145 h.p. Super-Scarab-powered Monocoupe Model D have resulted in the introduction by the Monocoupe Corporation, Robertson, Mo., of a neat and trim-appearing plane offering better performance and increased comfort.

The new plane is 20 feet 5 inches in length and has a span of 32 feet. Additional room over older models is available as a result of adding six inches to the cabin width and changing the seating arrangement and controls. Ventilation for the two occupants is provided by a fresh air duct bringing air into the cabin from a point forward of the engine and by a manually-controlled ventilator at the rear of the cabin roof, while additional air can be obtained by opening outward a hinged window on the pilot's side of the cabin.

Arrangement of Instruments

The enlarged instrument panel allows sufficient room for blind flight instruments. A fuel control valve is at the bottom and center of the panel, and the two wing tanks have sight gauges at the top of the cabin on each side. The reserve sight gauge is forward of and above the instruments. The gasoline system consists of two 15-gallon wing tanks and a 4.5-gallon reserve tank forward of the instrument board. Oil capacity is 3.5 gallons.

The reserve tank is filled continuously through the main tanks as long as the main valve and the reserve valves are in the "on" positions. With the fuel valves in these positions, gasoline may feed from either or both wing tanks and the reserve.

Controllability and maneuverability are achieved with minimum control loads transmitted to the pilot. An easily-removable metal cowl covering the bottom of the fuselage provides quick inspection of controls.

The two-piece wing with a total area of 129.7 sq. ft., is externally braced, and a special fairing built in at the strut intersection provides space for mounting streamlined landing lights into the under side of the leading edge. A portion of the leading edge at the root and the entire top of the cabin back to the rear spar is covered with Plastacele, as are the windshield and windows, which extend back to the rear of the cabin, a construction which has improved visibility.

Longitudinal balance is controlled by a movable tab on the elevators which in turn is adjusted by a lever in the cabin. A continuous adjustment, with sufficient range for all normal loading conditions and allowing rigid stabilizer construction, is provided.

The combination NACA and tunnel type cowling used give slow head temperatures, while rapid and easy cowling removal for servicing and inspection is possible by its construction, and the use of Dzus fasteners.

The landing gear employs a combination oil and shock cord tension strut located in the fuselage and fastened to the wheel axle by streamlined brace wires. A full swiveling steerable tail wheel with pneumatic tire and employing a shock cord shock absorber is used. Wheel pants are standard equipment.

Performance Characteristics

Two features of the Model D are its speed range and economy of operation. Performance figures show a top speed of 165 m.p.h., a cruising speed of 140 m.p.h and landing speed of 50 m.p.h. At cruising speed, with the engine turning 1925 r.p.m., fuel consumption is between 8 and 8.5 gallons per hour, which gives approximately 17 miles per gallon. The weight of the ship empty is 1228 pounds and the gross weight 1860 pounds.

Standard equipment includes the usual instruments (turn-&-bank, and rate-of-climb extra) electric starter, battery, Hamilton Standard variable pitch metal propeller, parking brakes, dual controls and brakes, and radio bonding.

Lockheed *Electra* Model 10A

●

● The Electra transport Model 10A, built by Lockheed Aircraft Corp., and the first of its type introduced by the Burbank, Calif., manufacturer, is a high-speed, all-metal, twin-engined transport, which, following completion of tests, is now available for the airline operator. A fleet of these ships has been ordered by Northwest Airways to reduce flying time and provide greater passenger comfort over its northern transcontinental route.

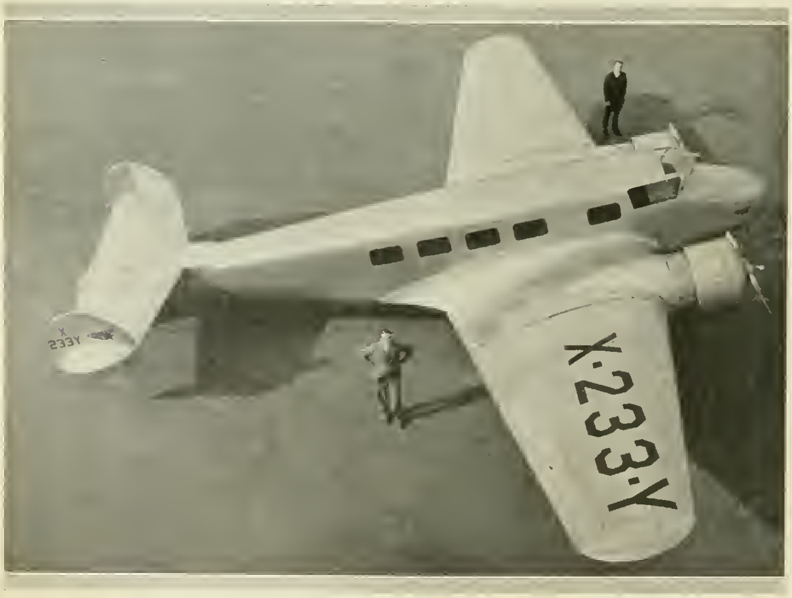
For the internal structure 24ST is used throughout and 24ST alclad for the skin. The center section, which embraces the engine nacelles, landing gear, fuel tanks and cargo compartments, is cut away entirely at the fuselage permitting it to be placed partly within the wing, thereby presenting minimum frontal area, with only slightly more than 3 feet of fuselage extending above the upper surface of the wing. The employment of a single main wing spar, built up of stamped sheet duralumin, continued through the fuselage, affords but little obstruction in the cabin aisle.

The full cantilever wings are of the semi-stressed skin type, readily accessible and repairable, with detachable wing panels to facilitate inspection and maintenance. The airfoil section at the root is the Clark Y-18, tapering to the Clark Y-9 at the tip. The angle of incidence is set at 0° while the wing taper in plan is 3:1. The center section is integral with the fuselage, but the outer panels are removable from points outboard of the nacelles so that in the event of wing damage, new units may be bolted in place. Two 100-gallon fuel tanks are located in the entering edge of the wing stub between the engines and fuselage and wing flaps are incorporated to reduce take-off and landing speeds. With the flaps lowered the gliding angle is reduced from approximately 14:1 to 8:1 and horizontal and directional balance is maintained with adjustable flaps at the trailing edges of the rudders and elevators.

Tail Group Arrangement

The tail of the fuselage provides rigid support for the cantilever empennage and the tail wheel. Stabilizer and elevators rest atop the fuselage, giving plenty of clearance between these surfaces and the ground and protecting them from damage by stones driven back by the blast of the propellers in taking off and landing.

The cabin, completely soundproofed by Western Electric engineers, is 57″ wide, 60″ high and 180″ long. It contains an efficient ventilating system combined with a thermostatic heat control which automatically maintains proper cabin temperature and assures correct fresh air conditions. Soundproofing of the cabin has been aided by allowing 1¾″ of space between the insulating material and the walls. Doors are heavily soundproofed and are of the same thickness as the cabin walls.



View from above, showing the clean lines and arrangement of the Lockheed Electra

The interior of the cabin, with accommodations for ten passengers, lends itself to several variations in arrangement. Lavatory facilities are at the rear of the cabin and baggage space is forward of the pilots' compartment in the nose of the ship and in the stub of each wing. A total of 68 cubic feet of baggage space is provided; 40 in the fuselage and 14 in each wing stub.

Maximum visibility for the two pilots results from the use of a well-faired nose section. Conventional wheel controls are provided as are complete instruments, including Sperry Directional Gyro, Sperry Artificial Horizon and two-way Western Electric radio. All electrical wiring is enclosed in metal conduit with conveniently located junction boxes.

The radio is located approximately 30 inches away from the battery, allowing short wiring and a resultant weight saving. The set is about 6 feet from the pilots' compartment, permitting a light, compact installation with short controls. Radio controls are mounted on a sub-instrument panel below the main panel and tilted for easy observation.

Control surface hinges are short coupled, well faired and provide extreme rigidity. In place of the usual type of aerodynamic balance for ease of control, the rudder and elevator loads are lightened by arranging the tab as a trimming device as well as a servo.

Landing Gear Mechanism

Engine nacelles support the landing gear and the retracting mechanism, since the retracted gear folds back entirely within the nacelle, leaving only a portion of the tire exposed.

Landing gear units are electrically operated by gears and torque shafts, controlled simultaneously by one motor. The retracting motor stops automatically when the wheels are either fully up or down. An auxiliary hand mechanism is available for use in the event of electrical system failure. The landing gear, with a tread of 13 feet 7 inches, is equipped with Goodyear Airwheels (35 x 15-6) and hydraulically-operated disc brakes which may be operated whether the landing gear is up or down. The Aerol shock struts have a stroke of 6 inches, and control of the Goodyear brakes is by a hand lever differentially connected to the rudder pedals.

Power Plants

Engines are supercharged Pratt & Whitney Wasp Juniors rated 420 h.p. at 2200 r.p.m. at 5000 feet. These engines have a blower ratio of 10:1 and a compression ratio of 6:1. They are bolted to welded steel tube mounts which are damped from vibration by rubber shock units of the Lord type, at the firewall. Inner and outer cowls are supported either to the mount or by additional shock units, thus making the entire engine installation rubber supported.

Each engine is equipped with a P. & W. oil regulator and heater assembly, which does away with the usual type oil radiator. There is provision for 14 gallons of oil. The installation of air scoops and carburetor air heaters provides maximum engine efficiency under all climatic conditions, while back pressure is reduced to a minimum by a collector ring of generous size. Hamilton Standard controllable pitch propellers are standard equipment.

Engine controls from the pilots' cockpit are of the Arens push-pull type, permitting easy installation with the fewest parts. At points where wear occurs, large bearing pins and bearings are provided.

The engine cowling, designed with nacelle to give low drag, is of the NACA type with a small inner cowl. All of the cowl aft of the nose piece is easily removable and the nose piece is placed far enough ahead of the rocker boxes to permit inspection and adjustment of valves and rocker arms.

Fuel and oil systems are simple and rubber hose connections have been used extensively to reduce possibility of failure due to vibration. Both fuel and oil lines are fabricated from the Aluminum Company's latest type 4SO aluminum and Parker duralumin fittings. Throughout the entire installation care has been taken to give ample clearance for maintenance, inspection and quick overhaul.

Specifications

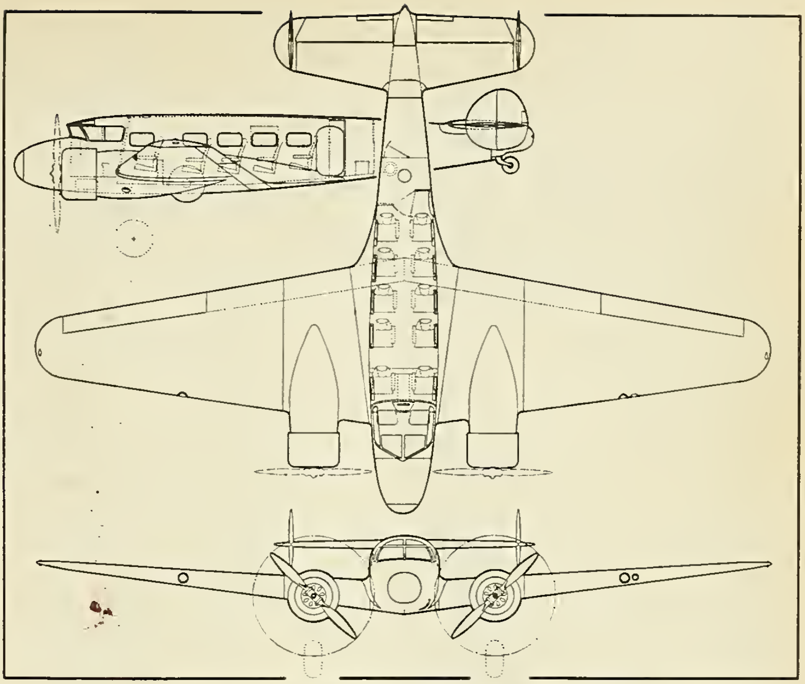
Length	38 feet 7 inches
Span	55 feet
Height overall	121 inches
Aspect ratio	6.60:1
Root chord	145 inches
Tip chord	48 inches
Volume passenger cabin	300 cubic feet

Areas (Square Feet)

Wings	458.3
Ailerons	29.2
Fins	15.0
Rudders	16.9
Stabilizer	48.0
Elevators	33.6

Weights (Pounds)

Useful load	3545
Weight empty	5855
Gross weight	9400
Power loading	10.71 lbs. per h.p.
Wing loading	19.64 lbs. per sq. ft.



Outlines of the twin-engined Lockheed Electra transport

Performance

Maximum speed at 5000 ft.	221 m.p.h.
Cruising speed at 2000 r.p.m. at 5000 ft.	203 m.p.h.
Landing speed (sea level) with flaps	63 m.p.h.
Rate of climb (sea level)	1350 ft. p.m.
Service ceiling	20,000 feet
Cruising range	750 miles
Cruising range	4.17 hours
Total power at 2000 r.p.m. at 5000'	840 h.p.
Gasoline consumption (cruising)	48 gal. p.h.

Recent Aeronautical Patents

The following patents of interest to readers of AERO DIGEST recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

Cooling system and cylinder head construction. Henry W. Ashmusen, deceased, late of Omaha, Neb. (1,940,522)

Indicator for aircraft. Joseph S. Bennett, Bradford, Pa. (1,941,533)

Aircraft control system. Richard P. Mueller, New York, N. Y. (1,941,616)

Aircraft propelling and controlling mechanism. Charles S. Hall, Los Angeles, Calif. (1,941,799)

Propeller. George F. Houston, South Bend, Ind., assignor to Bendix Research Corp. (1,942,100)

Variable pitch propeller. Harris C. Roth, South Bend, Ind., assignor to Eclipse Aviation Corp. (1,942,126)

Aircraft wing structure and airplane body. Earl J. W. Ragsdale, Norristown, Pa., assignor to Edward G. Budd Mfg. Co. (1,942,148 and 1,942,149)

Methods of making propeller blades. John Squires, Detroit, Mich. (1,942,221, 1,942,222, 1,942,223 and 1,943,560)

Airplane wing spar. Roy G. Miller, Farmingdale, N. Y., assignor to Curtiss Aeroplane & Motor Co. (1,942,391)

Apparatus for measuring altitude. Ross Gunn, Washington, D. C. (1,942,421)

Gyro vertical for aircraft. Preston R. Bassett, Rockville Center, N. Y., assignor to Sperry Gyroscope Co. (1,942,470)

Radio navigating system. John A. Willoughby, Washington, D. C. (1,942,526)

Apparatus for determining speed and direction of aircraft and of moving targets. Antonio Clementi, Vienna, Austria. (1,942,536)

Altimeter installation. Paul S. Edwards, Fort Meade, Md., and Constantin D. Barbulesco, Dayton, Ohio. (1,942,594)

Airplane power-plant. Cameron A. Whitsett, Chicago, Ill. (1,942,674)

Fluid foil. David R. Davis, Los Angeles, Calif. (1,942,688)

Gyroscope control. Garfield A. Wood, Algonac, Mich. (1,942,737)

De-icer for airplanes. Charles W. Leguillon, Akron, Ohio, assignor to B. F. Goodrich Co. (1,942,867)

Helicopter lifting screw and operating mechanism therefor. Paul F. West, Philadelphia, Pa. (1,942,888)

Means for preventing formation of ice on airplanes. Edward A. Driscoll, New York, N. Y. (1,943,062)

Safety device for aircraft. Gaetano Ajello, New York, N. Y. (1,944,484)

Aircraft indicator. Adolf Urfer, Richmond Hill, N. Y., assignor to Pioneer Instrument Co. (1,944,619)

Parachute rip cord apparatus. Harvey E. Lafayette, Waukegan, Ill., assignor to Irving Air Chute Co. (1,944,795)

Parachute apparatus. Erwin H. Nichols, Brooks Field, Tex., assignor to Irving Air Chute Co. (1,944,801)

Aircraft cowling. Lieut. Comdr. Walter S. Diehl, Construction Corps, U. S. Navy. (1,944,878)

Aircraft covering. Franco Mazzini, Milan, Italy, assignor to Societa Italiana Ernesto Breda Per Costruzioni Meccaniche, same place. (1,944,990)

Air brake for aircraft. Horace D. Black, Uxbridge, England. (1,945,214)

Aircraft. George W. Cornelius, Glendale, Calif. (1,945,520)

Aerial advertising device. Malcolm A. Neal, San Francisco, Calif., assignor to Aerial Advertising Co. (1,945,785)

Parachute. Josef Eschner, Vienna, Austria. (1,946,066)

Noiseless propeller blade for aircraft. Joseph Cebuski, Salem, Mass. (1,946,129)

Apparatus for varying pitch of aeroplane propeller blades. Charles Y. Chance and Murray K. Patten, Detroit, Mich. (1,946,387)

Propeller with auxiliary blades applicable to driving aircraft. Emil A. Briner, East Orange, N. J. (1,946,571)

Helicopter. Milford L. Darr, Oakland, Calif. (1,946,614)

Gyroscopic instrument for aircraft. Stephen J. Zand, Forest Hills, N. Y., assignor to Sperry Gyroscope Co. (1,946,657)

Direction finder compensator. August Leib, Berlin, Germany. (1,946,703)

Means for preventing spinning in aircraft. Edward A. Stalker, Ann Arbor, Mich. (1,946,921)

Course indicating and signaling apparatus. Rubino Plastino, New York, N. Y. (1,947,018)

Propeller. John M. Wilson, Osborn, Ohio. (1,947,073)

Airplane propeller. John E. Thompson, Paisley, Ont., Canada. (1,947,365)

Navigational apparatus. Thomas R. Rhea, Schenectady, N. Y., assignor to General Electric Co. (1,947,434)

Tip flap aileron. Theophile de Port, Dayton, Ohio. (1,947,461)

Retarding device for parachutes. William A. Gibson, Succasunna, N. J. (1,947,468)

Electrical marking device for airplane landing fields. Ross Gunn, Washington, D. C. (1,947,469)

Shock absorber for parachutes. Samuel Wiley, Metuchen, N. J. (1,947,507)

Aircraft propeller. Emil Manasek, Berwyn, Ill. (1,947,560)

Stabilizing and directing gyroscopic control mechanism. Louis Marmonier, Lyon, France. (1,947,562)

Aircraft of the rotative wing type; aircraft with rotative wings and aircraft with rotative sustaining blades. Juan de la Cierva, Madrid, Spain, assignor to Autogiro Co. (1,947,901; 1,948,455 and 1,948,456)

Airplane. Jakob Hojnowski, Nekoosa, Wis. (1,947,908)

Aeronautic training apparatus. Heraclio Alfaro, East Cleveland, Ohio. (1,947,908)

Balance indicator for aircraft. Paul A. Goldsworthy, Berkeley, Calif. (1,948,030)

Aerial display. Harry H. Haines and Karl L. Lange, Akron, Ohio, assignors to Wingfoot Corp. (1,948,295)

Aircraft. William F. McBride, Shreveport, La. (1,948,426)

Aircraft sustaining rotor. Agnew E. Larsen, Huntingdon Valley, Pa., assignor to Autogiro Co. (1,948,457)

Aircraft sustaining rotor and aircraft with rotative wings. Juan de la Cierva, assignor to Autogiro Co. (1,948,458 and 1,948,514)

Ray aviation compass. Sigvard L. Weber, Brydon Baker, and Edward W. Jensen, Los Angeles, Calif. (1,948,552)

Aircraft. Charles L. Fortier, Montreal, P. Q., Canada. (1,948,574)

Inclinometer for airplanes. Guy C. Bouchard, Kalamazoo, Mich. (1,948,612)

Airplane. Harold Pitts, Spokane, Wash. (1,948,629)

Method of making propeller blades. John Squires, Detroit, Mich. (1,948,832)

DIGEST OF FOREIGN TECHNICAL ARTICLES

(*Continued from page* 51)

Wind-Tunnel Interference

The Interference of a Wind Tunnel on a Symmetrical Body, H. Glauert. (British) Aeronautical Research Committee—Reports and Memoranda No. 1544, May 24, 1933 (Published October 30, 1933) 8 pp., 4 figs., 2 tables.

SINCE THE theoretical induced correction for wind-tunnel interference requires a large empirical factor of rather uncertain magnitude, the whole problem was reviewed in the reported investigation. It is assumed that the interference depends partly on the induced velocity of the current theory and partly on a wake correction, analogous to the old choke correction. Experimental results have been analyzed to check the validity of this conception and to derive values of the wake correction. The effective width of the wake, affecting the interference factor, is shown to be represented by a single curve against the fineness ratio for all shapes of body.

Airplane Designs

International Archives for Aircraft Construction (Internationales Archiv fuer Flugzeug-Konstruktionen), Fritz Hohm, Editor. No. 4, 1933. 16 sheets, 14 figs.

THESE ARCHIVES are published in the form of drawings on loose sheets, showing three views of the airplane and giving the principal dimensions in meters. They cover aircraft of other countries as well as Germany. In some cases, such as the Boulton and Paul P.64 airplane, additional sheets are included illustrating the construction of the airplane, its fittings, parts of special interest, and performance diagrams and specifications. The present installment contains details of the Potez 53, Messerschmitt M27b, Boulton and Paul P.64, and the D.K.W. Erla Me5a.

PAN AMERICAN SIKORSKY S-42

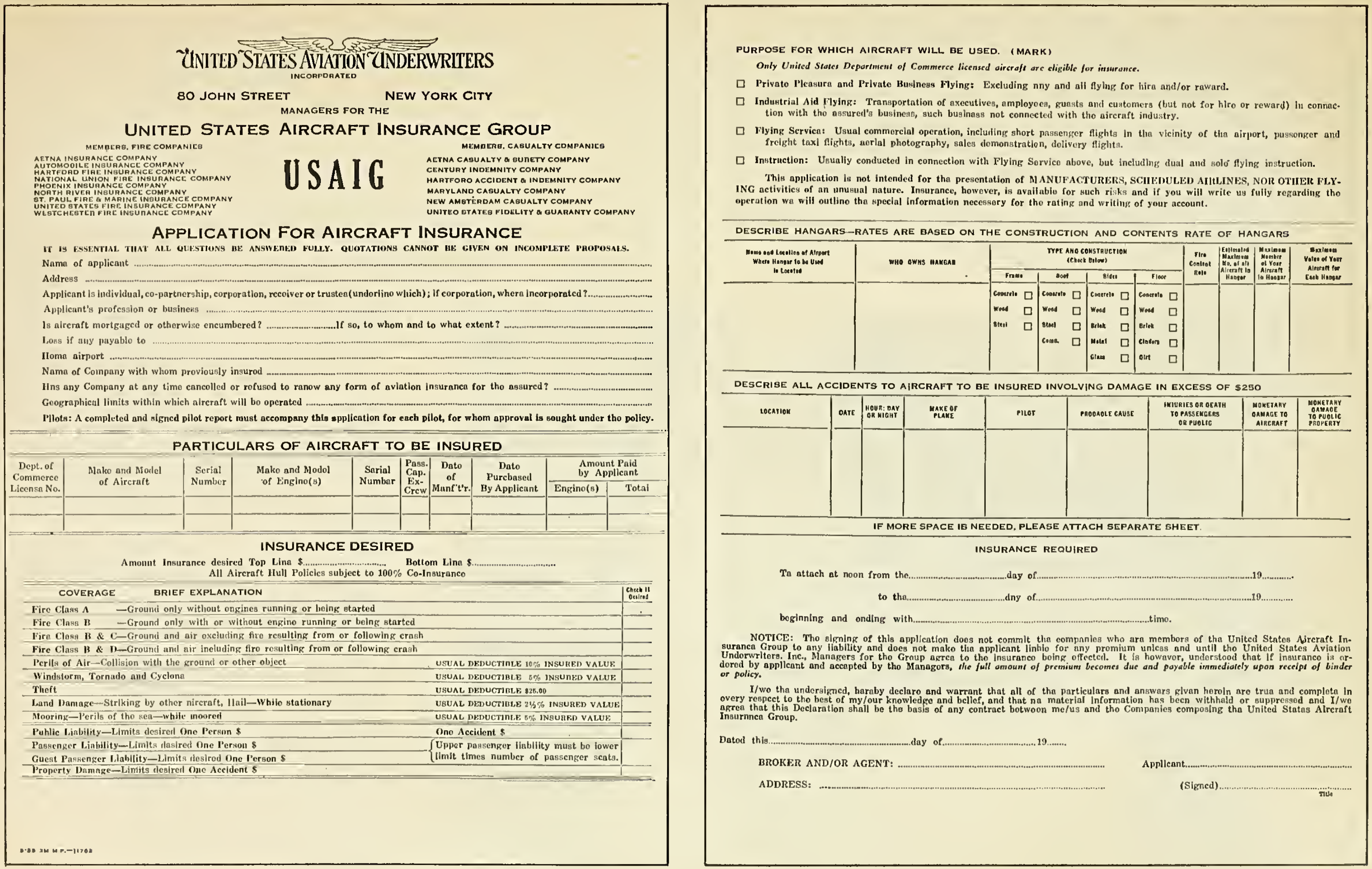
(*Continued from page* 57)

ocean by means of four short waves and communication with continental European stations and with steamships by means of the two long-wave frequencies. In case of an emergency landing, it is possible to use the radio for a period of 72 hours. Identical with the one used by the Lindberghs in their recent flights, this set was developed by Pan American engineers over a period of five years under the direction of H. C. Leuteritz, and is able to pick up messages from 16 to 200 meters and from 550 to 12,000 meters.

Although larger than its predecessor, it permits the carrying of far more useful load, and while its weight empty is a ton less than the older Clippers, it weighs, fully loaded, approximately two tons more. The wing loading is far greater in the new ship. Igor Sikorsky, the designer of both the S-40 and the S-42, explained that for efficiency and passenger comfort he believed high wing loadings to be especially desirable. The wing area of the new ship is 1,330 square feet as compared to 1,740 in the S-40.

The usual Sikorsky outrigger tail and short hull arrangement has been abandoned in the S-42, with the hull extending back to carry the tail surfaces. The tail span is 34 feet 2 inches, and the tail chord 80 inches. Fins and rudders are 18 feet 4 inches apart, the horizontal surfaces are 86 inches above the water line, and the height of the ship at the rudders is 24 feet. At the bow of the ship space is provided for storing a 225-pound bronze anchor and about 150 feet of stainless steel cable. The anchor may be dropped through a hatch under the port side bottom of the ship at a point just above the normal water line.

The ship made its first flight on March 30, when it took off with a load of 27,000 pounds in the first of a series of load tests.



UNITED STATES AVIATION UNDERWRITERS
INCORPORATED

80 JOHN STREET NEW YORK CITY

MANAGERS FOR THE

UNITED STATES AIRCRAFT INSURANCE GROUP

MEMBERS, FIRE COMPANIES
AETNA INSURANCE COMPANY
AUTOMOBILE INSURANCE COMPANY
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HARTFORD ACCIDENT & INDEMNITY COMPANY
MARYLAND CASUALTY COMPANY
NEW AMSTERDAM CASUALTY COMPANY
UNITED STATES FIDELITY & GUARANTY COMPANY

APPLICATION FOR AIRCRAFT INSURANCE

IT IS ESSENTIAL THAT ALL QUESTIONS BE ANSWERED FULLY. QUOTATIONS CANNOT BE GIVEN ON INCOMPLETE PROPOSALS.

Name of applicant ....

Address ....

Applicant is individual, co-partnership, corporation, receiver or trustee (underline which); if corporation, where incorporated? ....

Applicant's profession or business ....

Is aircraft mortgaged or otherwise encumbered? ....If so, to whom and to what extent? ....

Loss if any payable to ....

Home airport ....

Name of Company with whom previously insured ....

Has any Company at any time cancelled or refused to renew any form of aviation insurance for the assured? ....

Geographical limits within which aircraft will be operated ....

Pilots: A completed and signed pilot report must accompany this application for each pilot, for whom approval is sought under the policy.

PARTICULARS OF AIRCRAFT TO BE INSURED

Dept. of Commerce License No.	Make and Model of Aircraft	Serial Number	Make and Model of Engine(s)	Serial Number	Pass. Cap. Ex-Crew	Date of Manf't'r.	Date Purchased By Applicant	Amount Paid by Applicant	
								Engine(s)	Total

INSURANCE DESIRED

Amount Insurance desired Top Line $............ Bottom Line $............
All Aircraft Hull Policies subject to 100% Co-Insurance

COVERAGE	BRIEF EXPLANATION		Check if Desired
Fire Class A	—Ground only without engines running or being started		
Fire Class B	—Ground only with or without engine running or being started		
Fire Class B & C	—Ground and air excluding fire resulting from or following crash		
Fire Class B & D	—Ground and air including fire resulting from or following crash		
Perils of Air	—Collision with the ground or other object	USUAL DEDUCTIBLE 10% INSURED VALUE	
Windstorm, Tornado and Cyclone		USUAL DEDUCTIBLE 5% INSURED VALUE	
Theft		USUAL DEDUCTIBLE $25.00	
Land Damage	—Striking by other aircraft, Hail—While stationary	USUAL DEDUCTIBLE 2½% INSURED VALUE	
Mooring	—Perils of the sea—while moored	USUAL DEDUCTIBLE 5% INSURED VALUE	
Public Liability	—Limits desired One Person $	One Accident $	
Passenger Liability	—Limits desired One Person $	Upper passenger liability must be lower limit times number of passenger seats.	
Guest Passenger Liability	—Limits desired One Person $		
Property Damage	—Limits desired One Accident $		

5-33 3M M.F.—11702

PURPOSE FOR WHICH AIRCRAFT WILL BE USED. (MARK)

Only United States Department of Commerce licensed aircraft are eligible for insurance.

- ☐ Private Pleasure and Private Business Flying: Excluding any and all flying for hire and/or reward.
- ☐ Industrial Aid Flying: Transportation of executives, employees, guests and customers (but not for hire or reward) in connection with the assured's business, such business not connected with the aircraft industry.
- ☐ Flying Service: Usual commercial operation, including short passenger flights in the vicinity of the airport, passenger and freight taxi flights, aerial photography, sales demonstration, delivery flights.
- ☐ Instruction: Usually conducted in connection with Flying Service above, but including dual and solo flying instruction.

This application is not intended for the presentation of MANUFACTURERS, SCHEDULED AIRLINES, NOR OTHER FLYING activities of an unusual nature. Insurance, however, is available for such risks and if you will write us fully regarding the operation we will outline the special information necessary for the rating and writing of your account.

DESCRIBE HANGARS—RATES ARE BASED ON THE CONSTRUCTION AND CONTENTS RATE OF HANGARS

Name and Location of Airport Where Hangar to be Used is Located	WHO OWNS HANGAR	TYPE AND CONSTRUCTION (Check Below)				Fire Content Rate	Estimated Maximum No. of all Aircraft in Hangar	Maximum Number of Your Aircraft in Hangar	Maximum Value of Your Aircraft for Each Hangar
		Frame	Roof	Sides	Floor				
		Concrete ☐ Wood ☐ Steel ☐	Concrete ☐ Wood ☐ Steel ☐ Comp. ☐	Concrete ☐ Wood ☐ Brick ☐ Metal ☐ Glass ☐	Concrete ☐ Wood ☐ Brick ☐ Cinders ☐ Dirt ☐				

DESCRIBE ALL ACCIDENTS TO AIRCRAFT TO BE INSURED INVOLVING DAMAGE IN EXCESS OF $250

LOCATION	DATE	HOUR: DAY OR NIGHT	MAKE OF PLANE	PILOT	PROBABLE CAUSE	INJURIES OR DEATH TO PASSENGERS OR PUBLIC	MONETARY DAMAGE TO AIRCRAFT	MONETARY DAMAGE TO PUBLIC PROPERTY

IF MORE SPACE IS NEEDED, PLEASE ATTACH SEPARATE SHEET.

INSURANCE REQUIRED

To attach at noon from the............day of............19............

to the............day of............19............

beginning and ending with............time.

NOTICE: The signing of this application does not commit the companies who are members of the United States Aircraft Insurance Group to any liability and does not make the applicant liable for any premium unless and until the United States Aviation Underwriters, Inc., Managers for the Group agree to the insurance being effected. It is however, understood that if insurance is ordered by applicant and accepted by the Managers, *the full amount of premium becomes due and payable immediately upon receipt of binder or policy.*

I/we the undersigned, hereby declare and warrant that all of the particulars and answers given herein are true and complete in every respect to the best of my/our knowledge and belief, and that no material information has been withheld or suppressed and I/we agree that this Declaration shall be the basis of any contract between me/us and the Companies composing the United States Aircraft Insurance Group.

Dated this............day of............19......

BROKER AND/OR AGENT: .... Applicant............

ADDRESS: .... (Signed)............
Title

This is a facsimile of a USAIG application

Pan American Sikorsky S-42 Flying Boat

● The Sikorsky S-42, first of six trans-oceanic type flying boats under construction for Pan American Airways, has been completed at the plant of the Sikorsky Aviation Corp., Stratford, Conn. Based on specifications of the airline company's line and staff engineers and their technical advisor, Col. Lindbergh, the S-42 is a four-engined, all-metal, high-wing monoplane flying boat. With a gross weight of approximately 19 tons and an estimated cruising speed of 150 m.p.h., the new "Clipper" is the largest flying boat ready for regular transport service.

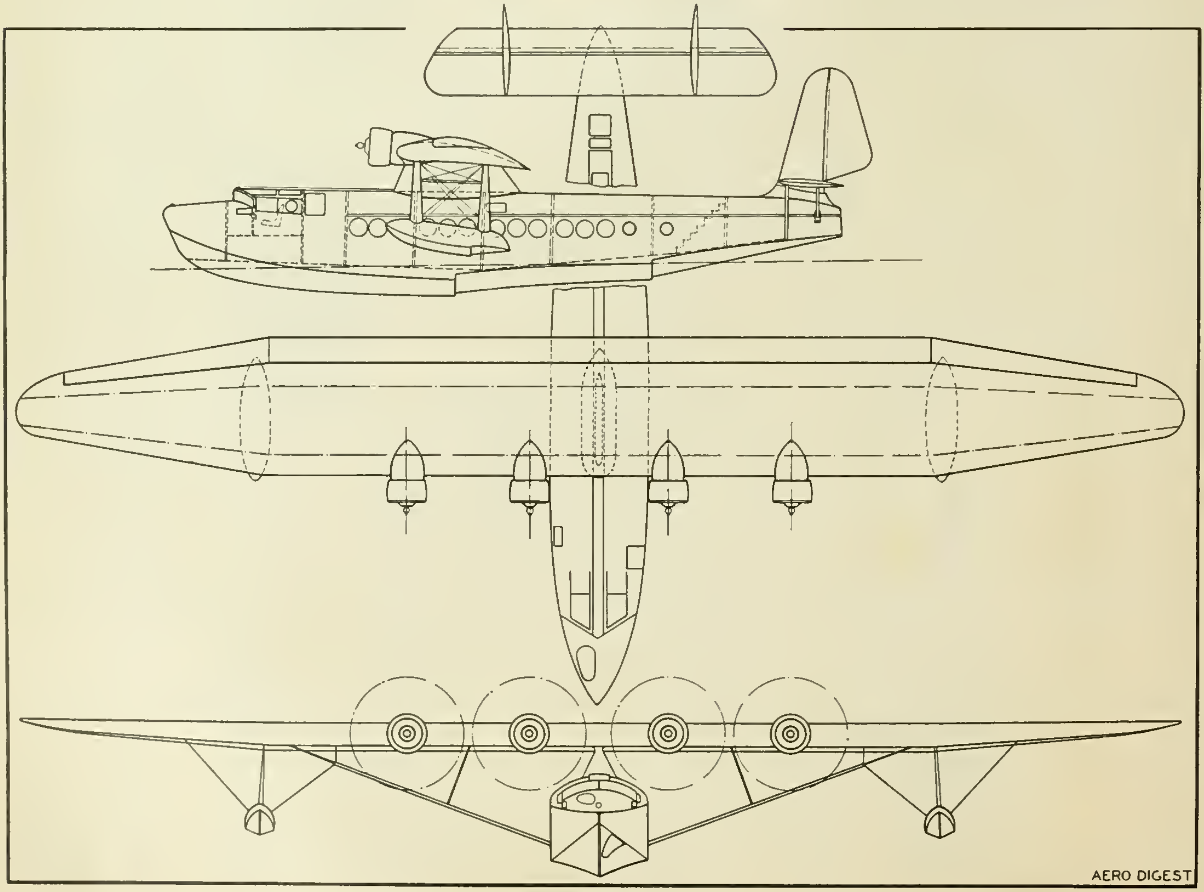
Designed primarily as a mail-carrying transport for long-range, high-load carrying, the S-42 is expected to be capable of flying 3,800 miles non-stop. With 32 passengers, a crew of five and 1,000 pounds of mail and express, its range is calculated to exceed 1,200 miles with cruising speed of about 150 miles an hour.

Igor Sikorsky, designer of the S-42

New processes in flush riveting have been followed in building the ship, and more than 340,000 rivets were used in the construction. The entire exterior skin is smooth except where, over the upper part of the fuselage, rounded rib-like exterior stringers sweep back in curves which follow the streamlining. The length of the ship is 68 feet 8 inches and in the hull, which is 115 inches wide and 122 inches deep, are accommodations for 32 passengers when the ship is used in South American service. In place of these accommodations, fuel tanks and mail compartments would be utilized when the ship is engaged in trans-Atlantic service.

Chrome molybdenum is used throughout for fittings and 17 ST duralumin for the skeleton structure and sheet metal covering. Fabric is used to cover the rearward portions of the wings where the loadings are light, while a wing flap, to aid in slow landings, extends throughout the length of the center wing panel, between the ailerons.

Clean streamlining and the symmetry of



Outline drawings of the new Sikorsky type S-42 monoplane flying boat its proportions give the big monoplane the appearance of being smaller than it actually is. With a wing span of 114 feet 2 inches, the S-42 is powered with four Pratt and Whitney Hornet S3D1-G engines (each developing 650 h.p. at 2,150 r.p.m. at an altitude of 5,000 feet) streamlined into the leading edge of the wing. The layout and construction of previous Sikorsky flying boats have not entirely been followed in this new boat; in the former, the wings were set relatively high above the hull and the engines located in nacelles slung underneath the wing, but in the S-42 minimum drag has been obtained by fairing the engine nacelles into the wing.

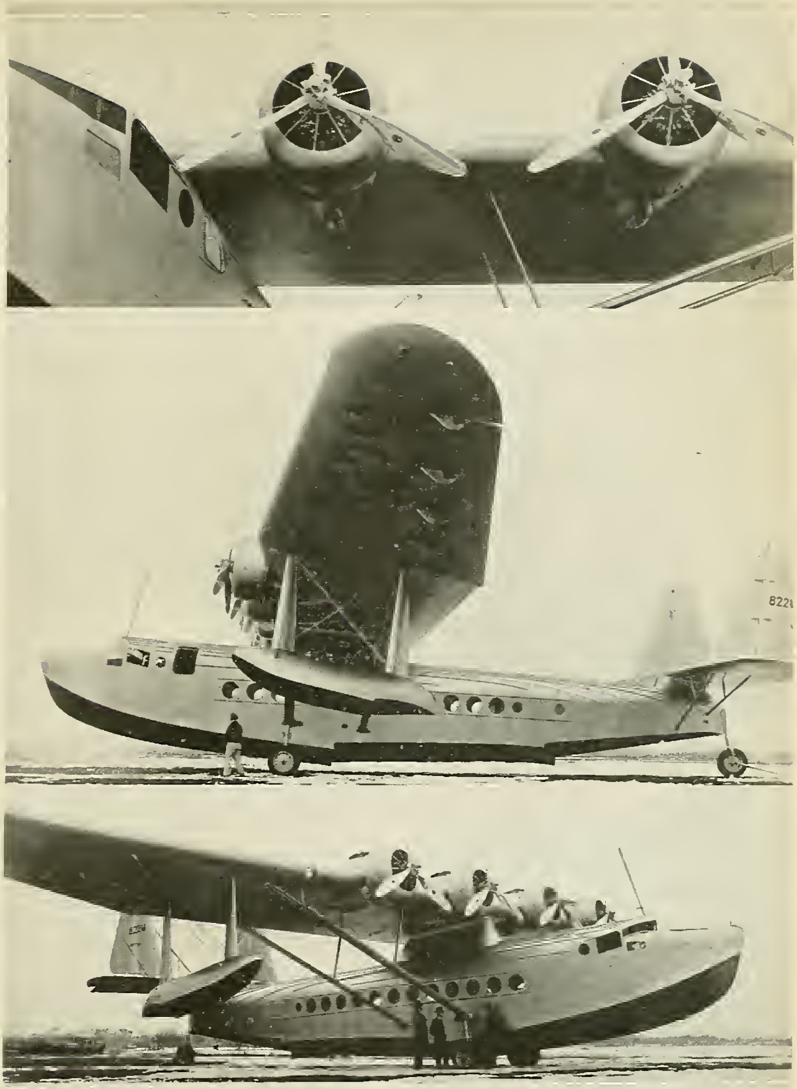
Rectangular in plan form, the center section of the wing contains the four engines with their three-bladed Hamilton Standard controllable pitch metal propellers. It is supported by a streamlined turret structure attached to the center line of the hull and inclined struts on each side. The full cantilevered outer wing panels are tapered in plan and section and carry ailerons for almost their entire length. These outer panels are set at a dihedral angle of 3 degrees. The maximum wing chord is 162 inches and the main wing beams are 80 inches apart at the center section. The wing section used is the TSM3.

The center engines are 13 feet 6 inches apart while the outboard engines are spaced 12 feet from the two inner engines, and to permit mechanics to work on the engines without special scaffolding, hinged sections built into the leading edges of the wing may be swung down to provide platforms.

Interior Arrangements

Every modern improvement to increase the speed, safety and comfort of the big craft is being utilized. Shatter-proof glass, produced by the Pittsburgh Plate Glass Co., is used throughout. All circular windows are sealed but the pilots' side windows may be slid back when desired. Ventilation in the cabin is secured through ducts, the air being let in at the central turret between the wing and body. Seats and floor sections are removable to permit inspection of the hull interior and Pyrotex insulating material of rubberized hair, used to soundproof the cabin, also protects the cabin from heat or cold when flying in the tropics or at high altitudes.

In the pilot's compartment the latest instruments have been installed. The actual flying instruments are in duplicate on either side of the cockpit, a set for each pilot. On each of these panels is a compass, directional gyro, sensitive altimeter, air speed indicator, turn-and-bank indicator and rate-of-climb indicator. In a center panel are four tachometers, manifold pressure gauges and provision for an automatic pilot which will be installed when the new ship goes into service.



Views showing construction details of the trans-oceanic Sikorsky S-42

All other instruments relating to engine performance (pressure, temperature gauges, etc.) are mounted on the bulkhead between the pilot's compartment and the passenger cabin in easy view and convenient to the flight mechanic's station located after the pilot's seat. The electrical system, controls and light switches are mounted on the bulkhead beside the radio operator. In case of fire an emergency lever at the mechanic's hand permits the engines to be smothered with extinguishing chemical. The gasoline is carried in wing tanks and led directly to the engines. A streamlined turret between the wing and cabin covers the main trusses which run directly from around the hull into the wing. This turret also houses the control cables for ailerons and engines as well as the wiring for the wing light electrical system.

Space for a radio operator is provided in the cockpit just aft of the co-pilots' seat. After this a ladder and hatch permits entrance and exit of the crew. At the stern of the ship is a hatch and stairway for entrance of passengers.

The 70-lb. radio transmitter is a Pan American development having a 20-watt power output, with the power supply permitting transmitting or receiving messages while the ship is in flight or afloat on the water. Six frequencies are provided, enabling communication with stations on the western side of the Atlantic

(*Continued on page* 54)

. NEW EQUIPMENT and METHODS .

Aerial Tow Banners

• DESIGNED BY R. V. Trader of R. V. Trader and Associates, Dravosburg, Pa., a new-type of aerial tow banner for advertising purposes has been successfully used on light planes of 40 horsepower, thus opening the aerial advertising field to smaller aircraft.

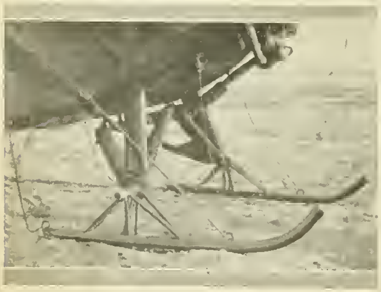
Tests have been conducted on the banners in the wind tunnel of the Carnegie Institute of Technology, Pittsburgh. The banner is of the detachable letter type using harness snaps and rings. Letters, each 5½ feet high, are made of special canvas of exceptional strength while bamboo, birch and spruce are used throughout as stiffening members. Joints are of welded steel tubing.

Designed to pack similar to a parachute, the 17-pound banner is placed under the fuselage of an airplane and released for opening at the will of the pilot. An outrigger balance carries the banner at an angle so that the reading side is slightly tilted over toward the ground. A release is provided for the airplane, and the banner is designed for release from the air, if necessary, in which event it parachutes down suspended from two trailing cones.

New-Type Airplane Ski

• AN APPROVED type certificate was recently issued by the Department of Commerce covering a new type, lightweight, faired airplane ski developed by Titus Richards in cooperation with the enginering department of North Dakota Agricultural College, Fargo, N. D.

The runner is made of steel tube, curved slightly throughout its entire length except the front end where it is bent to a much greater degree and is reinforced with a vertical steel strip welded into position. The pedestal, also of tubular construction, is designed to fit axle stubs for standard wheels while the shock cord and limiting control cables are attached to steel hooks welded to the runner at the front and aft positions. Both ends of the runner are sealed to keep out snow or moisture.



Steel tube skis on a Monocoupe

The ski bottom being slightly curved instead of flat as in the conventional ski, enables a pilot to rock the ship loose in the event the skis freeze. Due also to the curved bottom, the tendency to resist pivoting and the possibility of axle overstress are reduced to a minimum while the narrow tubular ski, by cutting through ridges and snowbanks instead of following every irregularity, assures smooth taxying and landing.

The tubular ski is light in weight and offers less air resistance than the ordinary flat ski, while another feature is the incorporation of the pedestal towards the rear, where an allowance of approximately 18 inches in front of the axle position for every 12 inches behind, shifts the load so that the front end of the ski does not tend to dig down into the snow.

Compact Portable Radio Receiver

• THE AERONAUT, a new radio developed by the Aeronautical Radio Co., is a small, compact, portable set operating on either AC or DC, which makes it of especial value to the air traveler. Excellent reception is obtained for Department of Commerce weather reports as well as entertainment broadcasts.

This superheterodyne six-tube set, contained in a moulded Bakelite case, operates on 110-120 volts, has automatic volume control, tone control and dial light. A neatly-fitted suede zipper case with hand grip is supplied with the set to facilitate carrying and also protecting it.

It weighs only 10 pounds, and is 11½" wide, 8¼" high and 7¼" deep and can easily be stowed away in a cockpit. Frequency ranges are 140-375 kc., and 500-1500 kc.

The Aeronautical Radio Co. carries a complete stock of the latest equipment for shielding engines at its Roosevelt Field headquarters, where service and parts for all types of radio shielding are available.

Flux-Filled Aluminum Solder

• A STUDY of aluminum solders for industrial use has resulted in the development of the Flux-Filled Aluminum Solder by the Kester Solder Co., of Chicago.

Claimed as practical and efficient, this new solder has been successfully used in such commercial and industrial work as radio and electrical manufacturing and in service work on aircraft, in garages, pattern shops, etc. The product has been developed of special alloy, with an efficient flux sealed within the core or center opening of the solder to satisfactorily meet aluminum soldering needs.

Air-Conditioned Storage Room

• A SPECIAL storage room, equipped with a York Freon Air Conditioning System, has been installed at Duncan Field, San Antonio, Texas, to provide facilities for the year-round storage and safekeeping of fur coats and winter flying garments. Three rooms, used to store films, photographic materials and paper, have also been air conditioned at this field, as a precaution against fire or explosion.

Temperature and humidity in these rooms are maintained at predetermined levels over varying periods throughout the year by means of automatic thermostatic control. In the fur storage room, government specifications called for a special schedule of temperatures, at different periods, ranging from a low of 18° to a high of 70°.

In the fire and explosion-proof film and storage rooms, a temperature of 55° is maintained by a York Freon unit driven by a 2 h.p. motor. Sprinkler systems are installed in the ceiling, and a vent stack in each room acts as a precaution against explosion. Temperature and humidity in all rooms are thermostatically controlled.

High-Speed Turret Lathe

• WARNER & SWASEY CO., Cleveland, Ohio, has developed a new high-speed turret lathe featuring a motor built into the head of the machine and a new bar feed.

Particularly adapted to small diameter work and non-ferrous materials where high-speeds necessitate very high spindle revolution, the machine incorporates a completely self-contained alternating current motor drive. The rotor is mounted directly on the spindle while the starter is in the head housing. Four speeds are available in either direction: 600, 1200, 1800 and 3600 r.p.m. Gearings and belts are eliminated and precaution against overheating taken by circulation of a high velocity air draft through cored passages around spindle bearings and motor windings.

Two levers control the spindle electrically through a drum type controller and automatic relays. The spindle can be quickly reversed without damage to the motor and a large band brake is actuated by the longer lever, in the neutral position, preventing rotation when attaching chucks, loading work, etc.

The high speeds possibile have necessitated a new combination of bar feed elements. For this purpose a friction finger bar feed, holding bars in a concentric position in the spindle to prevent vibration and enclosing them for their full length in a protecting tube has been developed.

Lakewood neon boundary light

Airport Flashing Neon Lights

● A SERIES of tests, conducted at Port Columbus, Columbus, Ohio, following exhaustive tests in Washington, have resulted in the approval by the Department of Commerce of the Lakewood Safety Neon Flasher for airport boundary and obstruction lighting.

The lights are operated by a wet battery and the entire unit, including the battery, flasher and neon, is self-contained. The mechanism is enclosed in a standard airport boundary cone with 7½ feet of neon mounted in the glass globe-enclosed head. With the approval of the Department of Commerce the ordinary white boundary lights are omitted, the red lights being used to mark the general outline and boundaries of the field, and the green neon lights used to mark approaches and runways. The best runway is marked at either end with three green lights and the second best runway marked at either end with two green lights. Thus the pilot approaching the field has only to line up either the two- or three-lighted runway and then approach one towards the other to land. The flashing light gives a distinctive lighting which is impossible to confuse with any other type.

This system makes it possible to light a field with the use of a minimum number of lights. The batteries will operate the flasher 24 hours a day for six months between re-charging and actual cost of operation is less than 2c per day.

A special unit, developed with the aid of the Army Air Corps, is portable and weighs, complete with battery, 34 pounds, allowing transportation of a number of these lights in a bomber or transport for use in lighting a field either in time of war operation or during maneuvers when it is necessary to operate off an unlighted site.

Pan American Airways has been conducting tests with these lights enclosed in buoys and moored in the water to mark lanes for water landings at night. They have also been experimenting with the light for use in Alaska, where no electric current is available.

Spark Plug Tester And Soft-Faced Hammer

● THE MAKERS of Stanley Tools, New Britain, Conn., have placed on the market two new interesting devices, one of which is a combination spark plug tester and screwdriver and the other, a soft-faced hammer.

Anchored in the hardwood handle of the low-priced tester is a neon flash tube for testing high frequency circuits. When the screwdriver tip is placed on a firing spark plug, distributor or a leak in the ignition wiring, the tube flashes a light which is visible through a slot in the handle and by the regularity and brilliance of these flashes, the condition of the parts tested is shown. The screwdriver is practical and has a 4-inch blade and a tip of high-grade steel and a comfortable hardwood handle.

The soft-faced hammer is for machinists, automotive and aircraft mechanics and others who work on finely finished surfaces or on the assembly of delicate machine parts. The hammer faces or tips are of a new resilient and tough celluloid composition, while the center body is of steel with a securely wedged hickory handle. Composition tips can be twisted off and new ones driven on, giving the tool almost unlimited life.

Universal Hose Clamps

● STAR HOSE clamps, made by Wittek Manufacturing Co., Chicago, Ill., are universal in type and fit all hose from 1 to 3 inches. The clamp is of rust-proofed, cold rolled steel with spaced bolt-holes to fit all applications. The bolt and nut are cadmium plated, and the former is of special design with a large-sized head giving an even pull in tightening the clamp. The clamps are packed in boxes of 10 as well as 100 and the manufacturer states that catalog sheets and other literature on the device are available.

Kollsman Instrument Installation Improvements

● SERVICING OF aircraft instruments has been facilitated by the development by Kollsman Instrument Co., Inc., Brooklyn, N. Y., of a unit for retaining instruments and eliminating the necessity of working in the limited space behind the instrument board.

Utilization of the new contrivance requires no change in existing mounting holes, does not add any weight or change the appearance of the board layout and is applicable to all boards. The instruments are installed from the front of the board and when their faces are flush with it, are fastened by turning a single screw two revolutions. Removal is accomplished by turning the same screw in a counter clockwise motion allowing the instrument to be taken from the front of the board.

Another improvement to facilitate instrument reading is the new Kollsman indirect lighting arrangement applicable to all aircraft and providing individual lighting for all instruments. With this new lighting system, glare or reflection into the cockpit or cabin of the plane is eliminated, the intensity of the light is controllable and no radio interference is set up because of its utilization.

Bulbs, each with a current consumption of .115 amps., are quickly and easily replaced by the pilot, during flight, from the front of the board. A feature of the new arrangement is its availability for installation in planes having no battery system.

Early this month, C. C. Crockett of the Kollsman company will make a demonstration tour in the Kollsman Waco cabin plane, visiting airline bases and aircraft manufacturers. In addition to showing the complete Kollsman instrument line, Crockett also will have the servicing device and indirect lighting arrangement on exhibit in the plane.

Bill Lear
busy making a business of his two hobbies
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SUPERHETERODYNE . . operates on either AC or DC . . 110–120 volts . . six tubes . . automatic volume control . . tone control . . dial light. Weight, 10 lbs. . . size, 11½" wide x 8¼" high x 7¼" deep . . frequency ranges, 140–375 kc. and 500–1,500 kc. Price, complete with RCA tubes, $39.95 . . suede zipper case, $2.50 . . send $5 with order, balance C.O.D.

ALSO: ***Complete equipment and service for shielding all makes of aircraft engines and accessories.***

AERONAUTICAL RADIO CO.
ROOSEVELT FIELD MINEOLA, N. Y.

RADIO SHIELDING

(*Continued from page* 47)

attaching this cable to the spark plugs are available at airport radio service stations.

The terminal block of the magneto must also be enclosed in a metallic housing. In order to prevent radiation from the fiber terminal block of a Scintilla magneto, for instance, it is necessary to use a housing that will clamp tightly to the metal frame and enclose the block. To accomplish this, there are several makes of cast aluminum magneto shields available on the market. A fitting is provided for attaching the shielded cable or wire shield leading to the spark plugs.

It is sometimes advisable to ground the braid on the shielded wire, not only at the magneto and plug ends, but also at one or more points along the length of the wire itself.

The ground wire from the magneto to the ignition switch must be shielded, and the shield braid grounded at both the switch and magneto ends. It may be necessary to use a shielded switch or enclose the terminal block of the ignition switch in a copper or aluminum housing. Shield wires more than two feet long should be grounded at several points along their lengths.

Where a booster magneto is used it is necessary to use shielded wire on the high tension lead. The braid of this cable also must be grounded at both terminals.

In planes equipped with electric generators, the leads to the generator and to the control box must be shielded, and a 1-mfd. bypass condenser should be connected across the armature terminals of the generator. The lead from the control box to the battery also should be shielded. Unless the control box and its terminals are enclosed in a metal case, a copper or aluminum box should be made to cover the relays and terminals.

It is not considered necessary to shield the electric starter circuit, as radio interference will only be generated when the starter is in operation. In general, any electrical device which has moving parts or generates high-frequency currents, must be shielded.

It is desirable to shield the wires to the navigation and landing lights, particularly when they run in close proximity to the antenna.

After the ignition system has been shielded, the plane should be flown for a half-hour or more to test the installation for static noises which may be generated by friction of the air on the surfaces of the plane. Should such noises be particularly noticeable in the earphones, the metallic parts of the plane should be bonded. However, most planes are practically bonded in construction.

Bonding consists of grounding all metal parts of the plane to the steel frame or engine mount. For this purpose, flat copper shield braid or ribbon is recommended. Principal points to watch are the ailerons, fin and stabilizer fittings, as well as the metal frames of landing and navigation lights. The hinges of control surfaces should have a length of copper braid connected across them.

All shielding and bonding must be mechanically and electrically secure. Soldered connections on all shield braid must be used. Metal clamps are not recommended except where there is no possibility of them becoming in contact with oil or dirt.

After a plane has been in operation for some time, frequent inspection of shielding and bonding will reveal if there are any loose or corroded connections which result in noisy radio reception.

CURTISS-WRIGHT CORP.

(*Continued from page* 35)

Wright Airports Corp. provided additional equipment at the various properties for ground school and flight training of students. In addition, the company reserved and leased space upon which commercial operators could build units for their operations.

Late last year, the policy of the company relative to the operation of airport sites and facilities changed and certain of its properties were leased to outside operators. These operators and the property involved include Chicago Aviation Corp., Chicago; Caldwell-Wright Airport, Inc., Caldwell; St. Louis Aeronautical Service Co., E. St. Louis; Associated Aviation Corp., Milwaukee and Becker Aircraft Sales, Inc., Pittsburgh.

In addition, the airports at Los Angeles and Baltimore are operated on management contracts, and all of the properties are being operated for sales and servicing private and commercial aviation purposes. The airports at North Beach, New Brunswick and Alameda are still being operated by the company with the airports, buildings and improvements owned by the Curtiss-Wright Airports Corp.

The officers of the Curtiss-Wright Airports Corp. are W. A. Leaycraft, president and treasurer; J. A. B. Smith, vice-president; R. R. Reger, secretary; W. A. Pollard, assistant treasurer, and Richard Voss, assistant secretary. Thomas A. Morgan is chairman of the board.

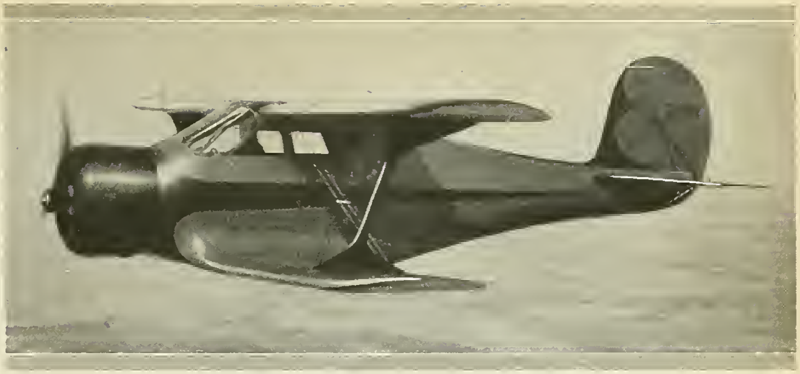
***The* CURTISS · WRIGHT "CONDOR". . .**
uses* AQUATITE *Waterproof Plywood

• From the modern Aerodynamic Laboratory of the Curtiss-Wright Airplane Company came one of the finest examples of aeronautical engineering—the Curtiss-Wright "Condor." Today a fleet of these luxurious transports are flying thousands of miles daily on the routes of American Airways and Eastern Air Transport. ¶ Selecting the parts and materials for these "Condors" was a task of extreme care. Significantly, the C-W engineers specified AQUATITE Waterproof Plywood.

THE CRESCENT PANEL COMPANY
LOUISVILLE, KY.

Aircraft engineers and manufacturers are invited to write for complete literature . . . without obligation.

Jacobs-powered Model B17L Beechcraft



● Built along practically the same lines as the 420 h.p. Beechcraft, the new model B17L differs from its counterpart in that it incorporates the use of a retractable landing gear and employs a Jacobs engine rated 225 h.p. at 2000 r.p.m. instead of a Wright Whirlwind of 420 h.p. In the larger powered model, streamlined wheels are used.

Accommodations for four or five persons are provided in a compact and roomy soundproofed cabin. Seats are wide and afford plenty of room, the two forward chairs being on slides allowing them to be moved out of the way when entering the plane. Interior trimmings and appointments have been selected not only with an eye to beauty, but also for comfort during long flights, with seats richly upholstered and all fixtures finished. Warm or cool air is supplied as desired.

The wings have an inverse stagger, a design also featured in the construction of the previous Beechcraft, and one which, together with the gap, elliptical dihedral wing tips and the wing section used, gives exceptionally good characteristics at high angles of attack. Tests have indicated that beyond the normal stalling angle the new Beechcraft settles under perfect control. In addition, further streamlining is possible through the use of this design, which also affords maximum visibility at all angles of flight. Wing spars are of spruce, fabricated solid, while ribs are spruce of built-up structure.

The windshield is of safety glass, molded to eliminate sharp corners. It is made complete in two sections, was developed under the supervision of Beech engineers and used exclusively for two years on the 420 h.p. Beechcraft.

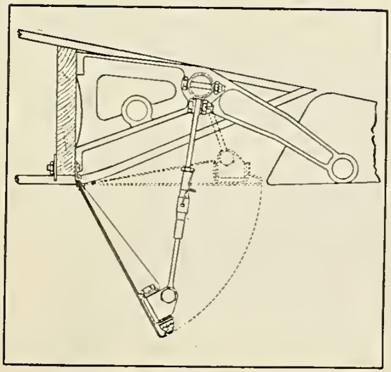
During construction when estimates of possible speed were based on the performance of the larger Beechcraft, a top speed of 170 m.p.h. was expected, but recent test flights revealed an actual clocked speed of a little more than 175 m.p.h., a cruising speed of 152 m.p.h. and a landing speed of 45 m.p.h.

This four-to-one ratio between top and landing speeds is obtained through the use of the landing gear as a retardant, and also built-in decelerators (wing flaps), which also increase lift.

When preparing to land, the decelerators, built into the under side of each lower wing panel, are opened fan-wise. At the same time, the landing gear is lowered into landing position to serve as a further drag to reduce the gliding speed.

The landing gear, of simple design, developed by Beech engineers, is fully retractable. Immediately after the take-off, the pilot pulls a control which retracts the unit into a space in the under part of the fuselage. The opening then shuts and locks, leaving a smooth surface under the plane. Oversight in lowering the landing gear is checked by making it impossible to close the throttle without releasing the landing gear latches. Although the entire operation is automatic, an auxiliary manually operated control is provided. The gear itself has a tread of 86 inches, uses 24-inch streamlined wheels and a roller bearing 10 x 3-inch tail wheel. Hydraulic shock absorbers are used on the landing gear, while shock on the tail wheel is taken up by rubber in compression.

The ship's empty weight is 1600 pounds, and it has a total useful load of 1550 pounds and a normal useful load of 1130 pounds. In addition there is an allowance for another 420 pounds, if any extra equipment is desired. However, all necessary flying equipment is included as standard.



Beechcraft decelerator mechanism

Controls are easily accessible with the throttle, mixture, landing gear control and stabilizer located in the center of the dash within easy reach. The fixed stabilizer adjustment is operated from the dash and movement of a knob located close to the throttle accomplishes this adjustment.

Standard instruments include: compass, altimeter, ammeter, tachometer, air speed indicator, oil temperature indicator, oil and gasoline pressure gauges. Standard accessories include starter, generator, navigation lights and storage battery.

Three-view outline drawings, photographs and a description of the original Beechcraft Model 17-R appeared in the December 1932 issue of AERO DIGEST.

About the first of April the Beech Aircraft Company will move into the modern and well-equipped plant originally occupied by the Travel Air Company in Wichita, Kansas, a step made necessary by the number of orders now on hand.

Specifications

Length	24 feet 5 inches
Span	32 feet
Height overall	8 feet 6 inches
Fuel capacity	50 gallons

Areas (Square Feet)

Wing	273
Ailerons	204
Fin	5.54
Stabilizer	20.93
Elevators	15.07
Rudder	8.61

Weights (Pounds)

Normal useful load	1130
Weight empty	1600
Allowance for extra equipment	420
Normal gross weight	2730
Maximum gross weight	3150
Wing loading	11.5 lbs. per h.p.
Power loading	14 lbs. per sq. ft.

Performances (Guaranteed to Within 2%)

High speed	175 miles per hour
Cruising speed	152 miles per hour
Landing speed	45 miles per hour
Climb, sea level, full load	1000 feet per min.
Service ceiling	15,000 feet
Normal range	650 miles
Fuel consumption (cruising)	12 gal. hr.

THE AIR SERVICES

Army Flies Curtailed Schedules

WHILE LEGISLATION aimed to return the transportation of the air mail to the private operators continues, the Army Air Corps is carrying the mail under schedules and over routes which are considerably less than were those undertaken during the initial stages of Army mail operations.

Early in the month under orders by Brig. Gen. Benjamin Foulois, all Army mail planes were grounded for more than a week, while an inspection of the army bases, equipment and personnel was conducted.

When flying was finally resumed, operations were confined to eight routes as follows: New York to Chicago; Chicago to San Francisco; New York to Atlanta and Jacksonville; Boston to New York; Salt Lake City to San Diego; Chicago to Dallas; Cheyenne to Denver and Salt Lake City to Seattle. The total mileage over which the Army resumed flights is 7,049, about 80 per cent of the mileage flown before the grounding order and about 40 per cent of the mileage flown by the commercial companies. Over many of the routes new bombers were used, in many instances one taking the place of two or three pursuit planes.

Fire, Gale Cause Damage

A SMALL-SCALE tornado struck the Naval Air Station at Pensacola, Fla., recently, and although causing material damage to many of the buildings on the field, did not damage flying equipment. Damage was estimated at $10,000.

A fire, believed started by spontaneous combustion, broke out in the carpenter shop at the Marine base in Quantico, but was brought under control before it had gained much headway.

Neon Signs Help Handle Macon

A CONTRACT was recently awarded to the Electrical Products Corp., Oakland, Calif., for the construction and installation of two remote control neon signs to be used in connection with the ground handling of the U. S. S. *Macon.*

The signs will each show five numerals which indicate barometric readings, temperature, wind direction and velocity, each reading being dialed electrically in the observation room of the aerology unit after current conditions have been observed.

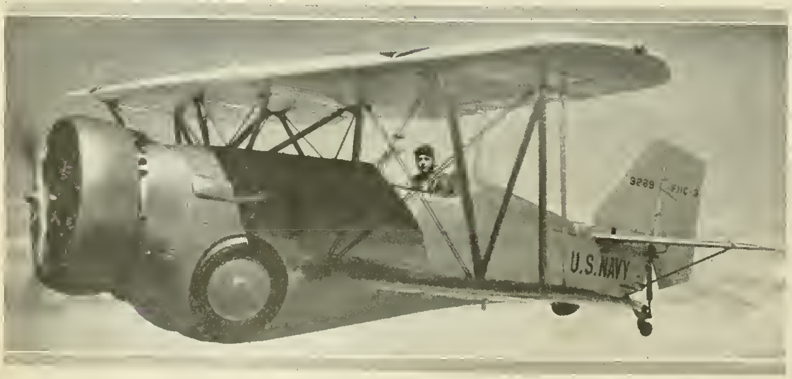
GLIDER FLYING MADE PART OF NAVY COURSE

BEGINNING IN June, half the men taking regular flight training at the Naval Air Station, Pensacola, Fla., will inaugurate their courses with instruction in glider flying, while the rest proceed with the ordinary training course. Instructors desire to ascertain whether glider students will learn to fly more quickly and make better aviators. A number of gliders have been ordered for the Navy's use.

Navy Tests New 'Chute Packs

TWO TYPES of quickly attachable parachutes which need not be worn until required in the event of an emergency are being tested at the Lakehurst, N. J. Naval Air Station.

Dummy tests designed to reveal any tendency of the harness to foul the arms of the jumper are made by covering the arms of the dummy with colored chalk. In the event of fouling, tell-tale marks are left on the offending portion of the harness or shroud lines. In addition, high-speed movies are made to indicate the position of the jumper during the drop and the action of parachute and harness. The Navy has been making many of its parachute dummy drop tests at the Lakehurst Naval Air Station for some time.



The Curtiss F11C-3, newest Navy fighter powered by Wright Cyclone engine

Navy Leases Norfolk Airport

THE NAVY has leased the Norfolk, Va., airport to provide additional accommodations for fliers with the U. S. fleet scheduled to arrive there in June.

The ships will land their air forces at the Norfolk Naval Base and the fliers will pursue a daily routine of flying, making the temporary acquisition of additional airport space necessary. More than 500 planes are expected at the base when the fleet arrives, not including the air complements of the *Lexington* and *Saratoga.*

Balloonists Pick Take-Off Site

AFTER A short inspection of the bag of the stratosphere balloon in which he and Major William Kepner will take off some time in June, Capt. A. W. Stevens, Army aerial photographer said the flight probably will start from the vicinity of Cheyenne, Wyo., or Rapid City, S. C., to avoid the possibility of being blown out to sea.

Capt. Stevens and Maj. Kepner are making the flight for the National Geographic Society and the Army Air Corps in the 3,000,000 cubic foot balloon now being built at the Goodyear-Zeppelin Corp., dock in Akron.

Seventy Graduate Kelly Field

THE ADVANCED flying school at Kelly Field, San Antonio, Tex., recently graduated a class of 70 students who received their diplomas from Brig. Gen. Francis Parker.

The men, seven of whom are regular army officers, will, according to a recent ruling, be assigned to various tactical units for training, after which they will be commissioned Second Lieutenants in the Reserve Corps.

Hangar Nearing Completion

FINISHING TOUCHES are now being made on the new hangar at Felts Field, Seattle providing the 41st Division, Aviation, Washington National Guard, a place where it can house its equipment.

Tiling, brick work, installation of doors and the laying of a cement floor still remain to be done. The building is 102 by 202 feet, has an opening 165 by 25 feet and is 25½ feet from floor to ceiling. Absence of any obstructions in the interior allows easy handling of any size plane.

Settle Ordered to Asiatic Duty

LIEUT. COMDR. Thomas G. W. Settle, co-holder with Maj. C. H. Fordney, of the stratosphere record and instructor in charge of training schools at the Lakehurst Naval Air Station, has been ordered, at his request, to the Asiatic Squadron.

CHANCE-VOUGHT
CORPORATION
EAST HARTFORD
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SUBSIDIARY OF UNITED AIRCRAFT AND TRANSPORT CORPORATION

NEWS OF THE SCHOOLS

Stewart Tech Teaches Mechanics

AN AIRPLANE and engine mechanics course is being offered by the Stewart Technical Trade School, New York, N. Y., together with a Master Mechanics Course, which recently has been added to the curriculum.

The airplane and engine mechanics' course is designed to teach a thorough understanding of airplane design, construction, operation and general maintenance in preparing the student for the airplane mechanics' license and engine mechanics' license required by the Department of Commerce.

A completely equipped layout is available at the school with an entire floor taken over for engine and aircraft testing, assembly and disassembly. Facilities are also available for the complete overhaul and testing of engines, propellers, ignition systems and for assembling and rigging a complete airplane.

According to Instructor H. E. Anderson, more than 120 students are enrolled at present, taking instruction in one of the four classes offered.

Penn School Graduates Mechanics

A FEATURE of the Fifth Annual Dance of the Penn School of Aviation held at the Pittsburgh Country Club was the awarding of diplomas to the graduating class of the airplane and engine mechanics division by C. B. Monro, vice-president of Pennsylvania Air Lines.

More than 300 persons attended the affair, which was under the supervision of F. R. Crawford, managing director of the school. A dancing contest, lucky number dance, a wide variety of entertainment, and a supper completed the program.

University Plans Aviation Building

PLANS OF a new Aeronautics Building for the Chaffee Junior College, Ontario, Calif., have been prepared and are expected to be accepted in time to allow completion of the structure in the very near future.

Of reinforced concrete walls, with steel roof trusses, the structure is to be one-story, 198 feet by 38 feet, with provisions for an engine laboratory, plane assembly room, store-room, offices, lockers and an engine and propeller testing room.

College Adds Aviation Courses

KENYON COLLEGE, Gambier, Ohio, is installing an Aeronautics Department in conjunction with its Physics Department and in addition, plans to offer flight instruction at its own airport now being constructed a mile east of the college grounds.

The ground school course is to include engine and airplane instruction and will get under way with the opening of the fall semester. Flying instruction, however, should commence with the opening of the field, which is a four-way project with two runways extending the entire length of the available surface.

PARKS GETS THIRTY NEW STUDENTS IN 10 DAYS

BANNER ENROLLMENT during the early school weeks added 30 new students in ten days to the roster of Parks Air College, E. St. Louis, Ill., aviation school. Six students picked the executive transport course, five the aeronautical engineering course, seven the master mechanics' flight course, nine the airplane and engine mechanics' course and two chose the regular transport course. Additional enrollments have been reported as coming in almost every week-end.

Radio Beam Flying Taught

TARKINGTON AVIATION CO., located at the Municipal Airport, Indianapolis, Ind., has added to its curriculum a course in radio beam flying instruction and practice and with the development of a light, highly efficient beam receiver installed in its Rearwin planes has been able to offer this instruction at low cost. According to E. Tarkington, president, many private pilots are availing themselves of this instruction at the school. the only one in its part of the country offering this kind of flying at present.

California School Approved

A RECENT award of an approved school certificate by the Department of Commerce, Aeronautics Branch went to the Grand Central Flying School, Grand Central Air Terminal, Glendale, Calif.

The certificate covers approval of ground and flying, limited commercial and private classifications. The school is operated in conjunction with the Curtiss-Wright Technical Institute of Aeronautics.

Landing Fields Charted

A LARGE NUMBER of new landing fields along the principal highways of western Washington will be charted by Prof. J. W. Miller of the Aeronautics Department of the University of Washington and Paul Mueller of the Washington Aircraft and Transport Corp.

Prof. Miller and Mueller will make a survey of all possible landing fields available to private flyers along main traveled highways as part of a master air-rail-water traffic system being prepared by the aeronautical classes at the University.

Instrument Laboratory Completed

A NEW INSTRUMENT laboratory is now available to students at Parks Air College, East St. Louis, Ill., following the installation of equipment by Burt H. Gould, in charge of aircraft instrument instruction, who recently returned from a visit to the plants of the Pioneer Instrument Co., Sperry Gyroscope Co., and Kollsman Instrument Co.

Complete equipment for testing, checking and adjustment of all types of aircraft instruments is being installed as rapidly as possible in the new laboratory and within a few weeks the school expects to have one of the finest instrument layouts in the country.

School Enrollment Increases

ROOSEVELT AVIATION School reports a considerable increase in enrollment of students for the month of January, 1934, as compared to the same month of '33.

The mechanic students have completed several overhaul and repair jobs and are now constructing a complete airplane with all the engineering being done by the students under the direction of the instructors.

New Training Plan Devised

A NEW METHOD of instruction, under which the student does not waste a single minute of the study period by occupying a plane with an instructor without learning why certain things are done, is being tried by Tony LeVier at Eastside Airport, near Montebello, Calif. Emphasis is placed not only on a thorough understanding of the plane, but also on control on the ground and in the air. Arrangements have been made to allow the student to take 12 lessons before securing his students' permit.

Boeing Adds Extension Courses

A SERIES of extension courses, covering various phases of air transport operations and designed particularly to meet the practical education needs of persons employed in the aviation industry has been developed by the Boeing School of Aeronautics, Oakland Municipal Airport, Oakland, Calif.

Courses in aircraft communications, aircraft engines, airplanes, aviation, meteorology and aircraft instruments, advanced avigation and air transportation are being offered.

According to T. Lee, Jr., general manager of the school, these home study courses were introduced specifically for employees of United Air Lines a year ago and they have proven so popular that it was decided to make them available to all companies.

C3 Primary Trainer Powered With 9
linder 120 H. P. Radial Engine

Spartan C3 Advanced Trainer Powered with Wright Whirlwind 175 H. P. Engine

Spartan C2 Radio and Blind Flight Trai
Powered With Wright Whirlwind 175 H.P. Eng

PARTAN The Modern School

-Students Working Under Actual Factory
n Methods in the Modern Spartan Factory

Modern in organization, equipment and personnel—THE ONLY MILLION DOLLAR COMMERCIAL FLYING SCHOOL IN THE WORLD GOVERNMENT APPROVED. Spartan 3 STAR ☆☆☆ Flying Courses incorporate all that is most advanced in aviation today, preparing you for a place with those who will LEAD Aviation tomorrow! Write today for details of Spartan—the MODERN School!

COMPARE THESE PRICES

Room Rent FREE with any course during entire period of training. Part time work if desired.

Transport Pilot's Flight and Ground Course	$1,745.00
Limited Commercial Pilot's Flight and Ground Course (Includes Master Mechanic's Ground Course)	520.00
Private Pilot's Flight and Ground Course (Includes Regular Mechanic's Ground Course)	375.00
Master Mechanic's Flight Course (15 Hours Flying)	300.00
Master Mechanic's Ground Course (5 Months)	225.00
Amateur Pilot's Flight and Ground Course (Includes Regular Mechanic's Ground Course)	285.00
Regular Mechanic's Flight Course (15 Hours Flying)	225.00
Regular Mechanic's Ground Course (3 Months)	135.00

The ECONOMICAL School!

SCHOOL

Spartan, the only MILLION DOLLAR Flying School in the World Gove
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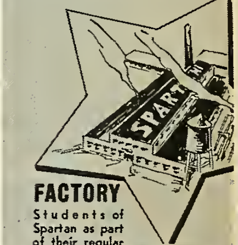
courses in all branches of Aeronaut



FACTORY

Students of Spartan as part of their regular courses get practical training in t
Spartan Aircraft Factory—one of t
country's most modernly equippe

SHOP

Further practical instruction on
types of ships is given the stude
in the Spartan Government A
proved Repair Station No. 50—o
of the highest rated in the Southwe

dents Working in the Modern Spartan Government
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SCHOOL-Students Studying Engine Construction in the Modernly Equipped Mechanical Division of the School

Spartan
SCHOOL OF AERONAUTICS

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Spartan Students Tomorrow—Aviation's Brightest STARS

Concentration of Roosevelt Aviation School Activities

● Aligning itself with a number of other pioneer schools that have found the atmosphere of the airport conducive to a more practical and interesting course, Roosevelt Aviation School will, on May 1, move its New York City division from West 57th Street to Roosevelt Field, Mineola, Long Island.

Before aviation was brought to the general attention of the public, Roosevelt Flying School (as it was then known) was operating at Roosevelt Field where flying students were prepared for licenses in the particular field in which they were interested. Then, when the government promulgated regulations for private flying and provided for the establishment of approved schools, Roosevelt Aviation School was granted the first government rating in the East for all classes of pilots from private to transport. This rating, moreover, has been retained during the intervening years and among the hundreds of Roosevelt graduates are members of the New York City aerial police force, leaders in aviation, professional pilots and sportsman fliers from all over the United States and many foreign countries.

As public interest continued to grow and the need for trained men became more urgent, it became apparent that instruction must be provided not only for fliers, but for ground personnel as well. The Ground School Division was created to give the necessary ground work to the flier and to provide training for mechanics in airplane and engine structure, maintenance and repair. The school on 57th Street was established because it was believed that much of the preliminary training could be given with the greatest convenience to the greatest number in the city. While this has proven true and has been continued for the past five years, it was necessary to maintain another school at the airport to receive the city-trained students and give them the necessary practical training at the airport. It is only after the airport section proved so valuable in practical training that the school officials decided to abandon its long-established policy and give the student the advantage of practical airport training from the inception of his course.

Conditions have changed materially in the last five years, particularly in the matter of convenience. Speedier train service and the construction of express highways have brought Roosevelt Field into easy and rapid touch with New York City. More than 80 trains per day ply between Manhattan and Brooklyn and Mineola (the Field station), many making the run in from 32 to 36 minutes. The new Southern State and Northern State Parkways, with their 40 m.p.h. speed limit, with no road crossings at grade, and consequently no traffic lights, bring automobile traffic within a few miles of the airport.

Roosevelt Field provides an ideal location for practical aviation training. Although it had more buildings and facilities than any other airport when aviation became of public interest, an extensive program of modern construction was undertaken and completed, providing additional buildings and more facilities than any other American airport. With some fifty buildings, housing many civilian planes, hard surfaced runways permitting take-off in practically any wind direction, two all-weather, all-way airports, miles of roads (the important ones paved), electric light, power and drainage systems, gas and other necessary utilities, it is a veritable city of aviation. Some thirty operators engaged in every aeronautical specialty, from the manufacture and sale of airplanes, and the operation of a scheduled airline to the most routine service operation, serve the flying trade. Since the Roosevelt Aviation School is owned and operated by the owners of Roosevelt Field, the student of the aviation school has access to these varied activities.

The removal of the city school to the airport will permit its consolidation with the department already there, making a larger and more compact unit. Buildings, particularly adapted to the work, are being renovated and adequate space is available for installing complete shop equipment and providing suitable class and drafting rooms. Whether the student is taking flying or mechanical training, or both, the entire plant and complete instruction in all departments will be conveniently available.

The purpose of Roosevelt School instruction is to provide a thorough and practical course enabling the graduate student to immediately engage in the professional application of his particular training. The curriculum is planned by a staff engaged in aerial operation and experienced through years of both operating and teaching. The new student is assumed to have no previous experience, and the method of advancement, step by step, together with the personal attention of the instructors, illustrates how each subject must be mastered.

Some of the students at Roosevelt Aviation School at work on engines, drafting and wing construction

As an illustration, the student entering the airplane course is assigned an instructor who teaches him the fundamentals of drafting. With a sufficient knowledge of this subject acquired, he proceeds with the first problem of laying out wing ribs. This accomplished, he is assigned to the woodworking department where he learns the operation of the various power saws, planers, sanding and other machines and when familiar with the use of this equipment, he is assigned to an individual work bench. Before attempting the practical execution of each problem, he attends lectures which permit a theoretical grasp of those subjects. At his bench he masters the use of woodworking tools, gluing practice and is prepared to undertake his first problem—the actual construction of one of the types of ribs he previously designed. He builds a jig and cuts the necessary pieces of wood for building a rib from the raw material, making various types of ribs until ready to proceed with his next woodworking problem. This problem, the design of a wing panel, includes rib and spar construction and the assembly of the unit. Upon completion of this structure, it is laid aside temporarily for instruction in covering, sewing, doping and lettering. This instruction takes him to the class room and the dope room, where he not only learns how to apply clear and pigmented dope to fabric, but also the use of the spray gun. He must learn to cover surfaces with cotton fabric, getting the proper tension so the surface will not warp when the dope is applied.

With this additional knowledge, the wing section he has constructed is then covered with fabric, properly sewed, the clear dope applied, the pigmented dope sprayed on and the finished product lettered. As the next problem covers allowable repairs on spars and wings, the completed section is then purposely damaged by the instructor. The student then removes the fabric, examines the damage and writes a report of his examination. If accepted as correct by the instructor, the student makes a drawing of the repair work to be done and when it has been approved he proceeds with the actual repair.

At this stage the student is then given additional practice problems to be executed with as little help from the instructor as possible. Each subject, such as metal fittings, welding, cable splicing, etc., is covered with the same thoroughness until all of the trades required of an airplane mechanic are completely understood. He is then ready to assist in working on the repair and reconditioning of airplanes for actual flight.

Having completed the airplane course, the student is assigned to the engine department, where the same definite schedule is followed in each step of engine mechanics. This completed, he enters the final training stage in which he is assigned to the general overhaul and repair department where airplanes and engines are reconditioned and prepared for flying. Here he receives training in every phase of work required to be done by aviation mechanics.

The criticism that the graduate of a technical school is purely theoretical and must learn to use that knowledge in actual experience is constantly in the minds of the School management. Unquestionably, one's knowledge is broadened and rounded by experience, but the entire curriculum is based upon actual practice. Trained from the start to apply the theoretical knowledge gained, and given the opportunity to work with the expert mechanics on planes and engines in actual operation, the student completes such a course with sufficient confidence and knowledge to permit the immediate practice of his trade. One operator alone on Roosevelt Field has ten graduates in his sales and service establishment, and many other graduates from this institution are also holding responsible positions in airplane factories, repair and service stations, airlines and aviation schools.

Train for Aviation!

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America's largest civilian airport.

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IF you're planning a career in Aviation . . . assure yourself of the success that should be yours in this fast growing industry . . . by getting the best training possible. . . . The Roosevelt Aviation School is an established institution with complete equipment for instruction in all Flight and Mechanics Courses. . . . In addition the facilities of famous Roosevelt Field are at its disposal.

Whether you wish to learn to fly . . . for sport or a professional career . . . or if you desire a complete mechanical training . . . you can get the best . . . by placing yourself under the guidance of Roosevelt experts.

The Flying School . . . carries Highest Government Rating . . . has its own separate training Field . . . uses Fleets exclusively for primary training . . . proper type of planes for advance instruction . . . expert maintenance on all equipment . . . and employs Rated Ground and Flying Instructors. . . . The courses offered are: — Amateur, Private, Limited Commercial and Transport Pilot—Ground and Flying.

The Mechanic School . . . has its own instruction shops at Roosevelt Field . . . offers a definite, proved type of instruction . . . has complete up-to-date equipment . . . ample space . . . and expert instructors . . . who make it possible for you to learn without your having had previous technical training.

Roosevelt graduates are holding responsible positions . . . and earning good salaries at airports and factories in this and foreign countries. . . . They know the importance of a careful, thorough training. . . . That is why they recommend Roosevelt. Visit, phone or write for Booklet (Y). Kindly state preference of course and give age.

ROOSEVELT AVIATION SCHOOL, INC.

City Office:
318 W. 57th St.
N. Y. C. Circle 7-1550

Roosevelt Field:
MINEOLA, L. I.
Garden City 8000

AT THE AIRPORTS

New Operators at Two Ports

OPERATIONS AND management of two airports have been taken over and will in the future be conducted under new ownership or lesseeship.

The Toledo Airport, situated on Stickney Ave., Toledo, Ohio, will be reorganized by Robert Koleman, the new operator, while the Curtiss airport north of Milwaukee will be operated under lease by the Associated Aviation Corporation of Milwaukee. This organization plans to conduct an aerial taxi service, and a repair and service station. Its officers include: E. J. Rogers, president; C. J. Orgran, vice-president and field manager, and C. H. Lindeman, secretary-treasurer and sales manager.

Coffeyville Port Being Finished

CONSTRUCTION WORK is still going forward at the recently dedicated municipal airport in Coffeyville, Kan., with rock surfaced roads, fish ponds, parks and drives and a municipal swimming pool nearing completion. In addition, shrubs and flowers have been purchased and planted for landscaping purposes.

Coffeyville Airways has already leased one hangar and several small structures and is operating the airport under the direction of Manager Linn Berentz.

Menefee Field Leased

THE MENEFEE Airport, formerly operated by American Airways under lease, is now under the supervision of the Parish of St. Bernard, New Orleans, La., according to A. S. Nunez, chairman of the local aviation committee. At the same time, it was announced that L. H. Folse was appointed manager of the field.

Menefee Field is five miles east of the business center of New Orleans and has two 2,500-foot hard-surfaced runways extending north-south and northwest-southeast.

Lincoln Operators Elect Sidles

HARRY B. SIDLES, son of the late H. E. Sidles, founder of Sidles Airways and one of the largest automotive distributing and jobbing concerns in the midwest, has been elected president of Sidles Airways, operators of an airport, flying school and charter service at Lincoln, Neb. C. L. Carper was elected vice-president and C. Stuart, secretary-treasurer.

New Ely Airport to Be Built

EARLY construction is expected on the proposed Ely, Nev., airport following completion of arrangements and approval of the site by R. E. Overman, state inspector. Although a mile and a half farther from town than Yelland field, the present airport, the new site will be more advantageous from a flier's standpoint, as it is level, has less variable winds, and is near the Lincoln highway. The hangar of Yelland field likely will be moved to the new site.

LONG-UNUSED AIRPORT IN NEBRASKA REVIVED

WORK WAS recently started on a 240-acre field at St. Paul, Nebr., which is about midway between Omaha and North Platte. The site is the same that was used as a control station for the 1919 reliability contest, and has been leased by the city for use as a municipal field.

Gainesville Buys Airport Site

FOLLOWING a special meeting the city commissioners of Gainesville, Fla., purchased a 240-acre tract of land for development as a municipal airport.

The new project is 3½ miles northeast of the city near the Seaboard Air Line Railroad and adjacent to the state highway. It is to have a tiled drainage system, a 2600-foot E-W and a 3600-foot NE-SW runway, boundary and obstruction lights and a six- or seven-plane hangar. T. S. Bryan has taken a lease on the airport and will assume complete charge as soon as it is completed.

New Managers For Chicago Port

CURTISS-REYNOLDS AIRPORT, near Glenview, Ill., built four years ago at a cost of $3,000,000, has been leased by a group of Chicago pilots and business men who have formed the Chicago Aviation Corp. Officers are Harold S. Darr, president; Herbert Anderson, vice-president; E. S. Staples, secretary, and A. R. Bone, Jr., treasurer.

Service, maintenance and all other operations at the field, with the exception of flying, will be under the direction of Mr. Staples, while flying operations will be in charge of Mr. Darr and Mr. Anderson.

Dallas Traffic Increases

AN INCREASE of 1655 passengers in 1933 over 1932 for Love Field, Dallas, Tex., has been announced. Traffic in mail and express also showed a large increase, with the latter greater than in any year since the inauguration of the traffic in and out of the city.

As a result of the signing of the transport code, there has been a 16 per cent increase in personnel and a 20 per cent increase in payroll at the field.

Ailor Business Going Strong

WITH UNFILLED orders for 22 new Waco planes on hand and deliveries already made on a number of used aircraft, Waco Sales of New York, Roosevelt Field, Mineola, N. Y., reports, through Howard Ailor, president, unprecedented activity in aircraft sales for the early part of the year.

In one week alone, the following planes were sold by Waco Sales: a Continental-powered de luxe cabin Waco to Sanford Airways, Sanford, Me.; a Wright-powered cabin Waco to Malcolm S. Mackay, New York, N. Y.; used Waco F's to John Maxellos, stage acrobatic star and Miss Miriam P. Blagdon, New York, N. Y.; a used Laird Speedwing to C. I. Bernard; a used Curtiss Fledgling to Safair, Inc., Roosevelt Field; used Kinner-Fleet's to Wilbur Cummings, New York, N. Y., and Major William Long of Dallas, Tex.; a Taperwing Waco to E. A. Forner of Jackson, Mich., and a used Lycoming Stinson to A. C. Van Arsdale, of Newtonville, Mass.

New Lighting System Developed

A NOVEL system of airport lighting which enables pilots to visualize the arrangement of buildings, obstacles and land areas simultaneously and without having to face the glare of beacons and searchlights has been designed by Capt. C. H. Biddlecomb, Clarence Chamberlin and Everett Sutcliffe.

The plan calls for the installation of neon lights set in light troughs flush with the road level and outlining the runways in yellow. In the "glow worm" airport, as the installation is called, it is felt that a compromise has been reached between the conflicting theories of whether an airport should be dimly lit or whether there should exist a most elaborate system of lighting. Buildings and obstructions would also be outlined in thin pencil lines of glowing light which are neither too bright nor too dim.

Aerial Advertising Division Formed

A NEW department, to be known as the Giro Sky-Ad Division, and including a sales and research staff devoted to the creation and promotion of aerial advertising campaigns with particular reference to tow banners, has been organized by Gilbert Flying Service.

C. B. Gilbert, president, announced that new offices have been obtained and in addition to new equipment and an improved type of aerial sky-ad, the company plans a reorganization of its personnel and the establishment of branches in the principal cities of the east coast. The company's new offices are in the Architect's Building, New York, N. Y.

ANNOUNCING

● THE New HAMMOND 3 PLACE BIPLANE

A 1934 MODEL
For Private Owners, Passenger Operation and Student Instruction . . .

Here's a husky, rugged ship with plenty of built-in flying stamina and dependable performance. It is beautifully balanced—and particularly adapted to passenger carrying for private ownership or operator use. We urge investigation. This new Hammond is thoroughly tested for strength of structure and fabrication . . . excels in smoothness of operation, rigid bracing features and anti-spin characteristics. We are confident you'll like this design. Send for complete details or arrange for a test ride. Dealers—write for selling franchise.

Standard equipment includes semi-air wheels with brakes—tail wheel—navigation lights—dual controls—exhaust collector ring and complete instruments. Cruises at 95 m.p.h.—lands at 35 m.p.h.

HAMMOND AIRCRAFT CORP.
YPSILANTI, MICHIGAN

$2995 Prices subject to change without notice

Indispensable

PIONEER TURN INDICATOR

Recognized as the central and most important instrument for blind flying, the Pioneer Turn Indicator instantly shows the slightest divergence from straight flight. The operation of the Turn Indicator is positive regardless of the flying position of the airplane ● With the Bank Indicator (built into the dial of all Turn Indicators), the Pilot is able to maintain a laterally level attitude while flying straight and to bank at the proper angle when turning. Write for our new booklet which illustrates and briefly describes twenty-seven important Pioneer Instruments.

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(*Continued from preceding page*)

Annapolis May Get Airport

ANNAPOLIS, capital of Maryland, and one of the few important cities in that state without an airport, may soon have one following several inspection tours of the city and its vicinity by William D. Tipton, head of aviation in Maryland, and manager of the Curtiss-Wright Airport at Baltimore, and I. A. Basarew, engineer for Curtiss-Wright airport.

While it is understood the Government is unwilling to purchase ground for an airport at this time, it is believed Federal authorities would eventually make such a purchase should the Annapolis airport become popular with the Navy.

California Airport to Reopen

THE BOARD of Supervisors of Santa Maria, Calif., recently voted a fund of $100 a month for the next 17 months as an operating subsidy to reopen the local port, inoperative for a year. The fund was given conditional to the granting of an equal amount by the city, and to the opening of the field by G. Allen Hancock, oil millionaire who founded it, and who has agreed to supply all finances necessary over the $200 a month guaranteed by Santa Maria and the county. The lighting system at the field will be reconditioned, buildings repaired and painted, and the weather bureau service, equipped by Hancock, re-established.

Sikeston Port Under Way

WORK HAS started on a municipal airport at Sikeston, Mo., midway between St. Louis and Memphis and dedication is expected to take place about May 1.

The airport, located two miles east of the city and north of a concrete road, will be available for gas, oil and lunch service.

$10,000 Pledged for Hangar

CAPT. A. E. LATHROP of Cordova, Alaska, recently started a drive for a $25,000 municipal hangar by personally pledging $10,000—with the promise of $10,000 more from another source, if the city would supply the remaining $5,000.

Airport Planned at Coulee Dam

THE GRAND Coulee dam site, Washington, where new towns are springing up and the federal government is spending $63,000,000 for a concrete dam for irrigation purposes, will have an airport, to be built immediately under the direction of Okanogan County Commissioners. It is planned to erect buildings for equipment and planes on the site which was chosen by Lt. Halford R. Wallace, of the 161st Observation Squadron. Moreover, Northwest Airways, Inc., plans to make the Coulee airport a regular stop, as considerable new travel is anticipated in the wake of the governmental project that will drain vast acreage and provide a large hydro-electric development.

New Operator at Seattle

LEONARD R. Peterson, Inc., has been formed at Seattle, Wash., as a flying service, and headquarters have been established in the Administration building at the municipal airport. Mr. Peterson is president, while Dr. Frank E. Parsley is first vice-president; Chester J. Chastek, second vice-president; J. M. Goldstein, treasurer, and Spencer Gray, secretary and attorney.

The new company plans to operate a number of planes and will establish a "fly-yourself" service with free instruction included in the rental of airplanes.

State Airway System Formulated

A PLAN for development of airways in Nebraska by the use of Federal CWA funds, with Grand Island as the focal point for the entire system of projected lines, has been formulated by Dr. W. W. Arrasmith, state advisory supervisor for airport improvement.

In addition to the lighted route through Omaha, Lincoln, Grand Island, North Platte and Sidney, and another official unlighted route from Omaha to Sioux City, under Dr. Arrasmith's plan lines would radiate from Grand Island to St. Joseph, Mo., Kansas City, Wichita, Kan., Denver, Aberdeen and Sioux Falls, S. D., Sioux City, Iowa, and North Platte, Crawford and Valentine, in Nebraska.

Direct communication by air would be established from Omaha to Osceola, St. Paul and North Platte; Omaha to Ord and Alliance; Omaha to Neligh and Stuart; North Platte to Sioux City; Sioux City to Crawford; Ogallala to Crawford; Ogallala to Denver; and Lincoln to Hastings, McCook and Denver. Dr. Arrasmith also outlined an entirely new straight-line route from Omaha to Grand Island and then on to Denver.

Grand Island on the revised airline map would be the nucleus for 10 airlines; Omaha would have four; Lincoln one, and several other Nebraska points, one to three each.

RUNWAYS ON SEASHORE AIRPORTS

By E. L. SCHWATT, Airport Designer

• Many airports have been built along the coastline, and in other places from the Chicago lake-front to the New Orleans river-front, on low meadowland and marshes, where hydraulic dredges have pumped in the required fill. For airports in such regions, the preparation of the terrain, with the necessity for raising the natural elevation of the land and developing an artificial grade, presents many interesting problems.

Proximity of the water-level to the surface of the runways requires special preparation to insure adequate drainage. Elevation is usually limited by the cost of the required cubic yards of fill. Under flood or storm-tide conditions, drainage may be inadequate and water may be present due to a condition similar to osmosis and capillarity, within a few feet or even a few inches of the runway surface. Natural surface drainage is usually effected by the elevation of the runway above the surface of the surrounding land and water, and the angle-of-repose of the pumped-in fill bordering the runway.

For proper drainage and to avoid a mud condition, consideration must be given to certain characteristics involving saturation, penetration and absorption. According to the data accumulated over a period of years on the Atlantic City airport by H. Bevan Baldwin, its builder and superintendent, gravel runways 150 feet wide are satisfactory when crowned 9 inches. Conditions which have proven to be best in all kinds of weather have been achieved by developing runways consisting of 7 inches of gravel, which is packed to 5 inches by rolling. Beneath the gravel, 12 inches of cinders are packed to 9 inches, and the resulting 14-inch layer, resting on a pumped-in fill of mud and sand, at an elevation of approximately 10 feet, has been found extremely commendable.

From the standpoint of initial cost, upkeep, efficiency and visibility from the air, gravel runways have demonstrated their value. This yellow material presents a clay-like surface containing smooth round pebbles. Due to its inherent cohesive qualities, surface repairs are easily made by filling with the same material, and its crowned surface may be maintained in a level, smooth condition by scraping.

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AVIATION GASOLINE
AVIATION ENGINE OIL
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To Manufacturers:
The "Shotweld" System of Stainless Steel Construction (patented) should interest you. Tests have proved that it has remarkable resistance to fatigue in ribs, wing beams and control surfaces. It is also proof against corrosion (even in salt water.) Our years of experience and engineering facilities are at your service.—Write for particulars.—

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Write us relative to your sheet steel requirements. This Company also manufactures U S S STAINLESS and Heat Resisting Steel Sheets and Light Plates for all purposes.

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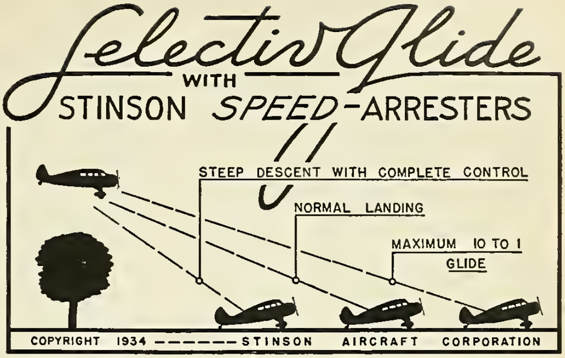
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STEEP DESCENT WITH COMPLETE CONTROL
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In the 1934 Stinson Reliant, you get an Airliner for the private flier.

You get the new Safety feature SELECTIV GLIDE, made possible with Stinson Speed Arresters.

You get cross-country reliability and comforts formerly found only in airline transport planes or in planes in the $10,000 price class.

Only in the Stinson Reliant can you get the reliable 225 H.P. Lycoming transport motor. *The motor is what counts most when you buy a plane.* Beauty, comfort, stability and low operating costs are important. Ability to take off quickly, to land in a short space and to cruise at 120 miles-an-hour are important features which Stinson gives in full measure, but after all, the motor runs the plane. Safety and economy depend on the motor.

The Lycoming is the most reliable motor in its power class, because it has been proven in more than 60,000,000 miles of flight, on airlines, and in the hands of commercial and private owners.

Compare the 1934 Stinson Reliant, point by point, with other planes and convince yourself that you get more for your money from Stinson.

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Write for your copy of Stinson Plane News, Mailed Free Postpaid

THE INDUSTRY IN GENERAL

New Boeing to Fly in June

THE FIRST of twelve additional transport planes being made at the Boeing Airplane Company's plant in Seattle will probably be test flown some time in June, according to company officials.

While full details of these planes have not been announced, it is known that they will be equipped with geared Wasp engines and three-bladed Hamilton Standard controllable pitch propellers to give them increased performance over the original Boeing 247 transports produced for United Air Lines.

All twelve of the planes are scheduled to be completed by the end of July, with some of them expected to go to United.

Air Mail Legislation Pending

RETURN OF the mail to the private companies under strict safeguards advocated by President Roosevelt is evidenced in the promulgation of new bills now being prepared in both House and Senate and by asking for new bids from reorganized airline companies by the Postoffice Department.

The McKeller-Black bill introduced in the Senate contains nine outstanding points including: provision for competitive bidding; contracts to run for three years, the bidders to get six months to qualify and the Interstate Commerce Commission to pass on the necessity of the routes and to set future rates of compensation six months before the contracts expire; provision for maximum flying hours for pilots, minimum pay and retirement benefits; limiting executive salaries to $17,500 a year, with bonuses and illegal expense accounts outlawed; barring of mergers, consolidations, combinations, subsidiaries, interlocking directorates, holding companies, affiliates or companies whose contracts have been canceled and the offending officers dismissed therefrom.

Subsequent testimony by Col. Lindbergh assailed the air mail measures before the committees on the ground that they constitute a blow at aviation; are unjust insofar as the former contract holders are concerned and that they provide for placing military pilots on commercial transport airliners as copilots. Eddie Rickenbacker called upon President Roosevelt to "purge his official party of traitorous elements" that had wrongly advised him in cancellation of contracts.

A bill designed to end the payment of subsidies to airline operators and to place the airline carrier on the same basis as the rail carrier was introduced by Senator O'Mahoney, but Representative Kelly planned to originate a new permanent air mail bill after the House Post Office Committee called off hearings pending the drafting of new legislation for air mail.

H. L. Hibbard, Lockheed's new vice-president

FOKKER GETS FOREIGN SALES AGENCY FOR LOCKHEEDS

EUROPEAN SALES and distribution rights for aircraft manufactured by the Lockheed Aircraft Corp., have been granted to Anthony H. G. Fokker, whose company, located in Holland, will handle Orions, Vegas and Electras in all countries except Sweden. Only Electras, however, will be handled by Fokker in Russia.

New Cessna Being Built

CONSTRUCTION WORK on a new Cessna plane has begun, according to officials at the plant in Wichita, Kans.

The new plane will be slightly larger than former four-place Cessnas, will be powered by a 145-horsepower Warner engine and is expected to have a top speed of about 170 miles an hour. Wing flaps will be among its features.

Lockheed Promotes Hibbard

IN RECOGNITION of his outstanding work in developing the new Electra, Lockheed Aircraft Corp., Burbank, Calif., has promoted Hall L. Hibbard, assistant chief engineer, to the post of vice-president and chief engineer.

Hibbard was in charge of the Electra design from its inception and has been associated with Stearman since 1927, when he went from the Massachusetts Institute of Technology to the Stearman Aircraft Co., Wichita, as a draftsman.

In 1931, Hibbard left the Wichita company to take charge of research work for Stearman-Varney, Inc., and when the group that was interested in latter purchased the assets of Lockheed Aircraft Corp., in 1932, Hibbard went to Burbank as assistant chief engineer.

In its latest tests, the Electra showed a top speed of 221 m.p.h. at 5,000 feet, while at 75 per cent of power, cruising speed was shown to be 203 m.p.h. at 10,500 feet. Tests were made over the measured California Institute of Technology course.

Approved Type Certificates Awarded

THE DEPARTMENT of Commerce has awarded approved type certificates to cover one autogiro, an engine and four propellers as follows:

Kellett Autogiro Corp., Philadelphia, Pa., model K4, two-place open-land autogiro powered by a Continental R670, 210 h.p. engine. Weights: empty 1707, useful load 655, gross 2362. A. T. C. No. 523.

Aeromarine Plane & Motor Co., Keyport, N. J., engine model AR340, 3-cylinder, radial air-cooled, rated 40 horsepower at 2050 r.p.m. Octane 73 required. A. T. C. No. 119.

Universal Aircraft Supply Co., St. Louis, Mo., propeller model U64, 6′ 4″ diameter, 4′ pitch, 2 blades rated 45 h.p. at 1,750 r.p.m. Of laminated birch and walnut with brass tipping. Weight (without metal hub) 12 lbs. A. T. C. No. 451.

Universal, propeller model U60, 6′ diameter, 4′ pitch, 2 blades, rated 30 h.p. at 1,750 r.p.m. Of laminated birch and walnut with brass tipping. Weight (without metal hub) 11 lbs. A. T. C. No. 452.

Hamilton Standard Propeller Co., E. Hartford, Conn., blade 6150, 13 ft., 11′6″ diameter. Number of blades optional, 250 h.p. per blade at 1,450 r.p.m.; controllable pitch of aluminum alloy, E. blade shank, 71½ lbs. per blade. A. T. C. No. 347.

Bennett Aircraft Co., Morganton, N. C., propeller model Samson CB-110, 8′ diameter, 6′ 4″ pitch, 2 blades, rated 90 h.p. at 1,400 r.p.m. Of laminated walnut, maple and birch with brass tipping. Weight (without metal hub) 21 lbs. A. T. C. No. 453.

New Kinner Agent Named

WITH HIS appointment as a Kinner aircraft dealer for the state of Oklahoma, Jerry B. Sass, of Oklahoma City, purchased and flew away a B-5 125 h.p. Sportster equipped with a demountable top, from the Kinner Airplane & Motor Corporation, Ltd., factory in Glendale, Calif., to Oklahoma City.

Among recent sales made by the Kinner company is included one to W. Arnet Speer, Kinner aircraft dealer for San Diego who took a Sportster.

Waco Reports $67,733 Profit for 1933

A NET profit of $67,733.04 has been announced by the Waco Aircraft Co., Troy, Ohio, for the year ending December 31, 1933. According to C. J. Brukner, president, an increased sales volume, accomplished without increased operating expense, resulted in an improved showing. Net profit as a percentage of sales increased to 6.95 per cent from 3.11 per cent over 1932.

For the export market Brukner reports the sale of Wacos to 14 foreign countries during the year.

December Exports Total $578,263

A SLIGHT decrease in value of aeronautical exports shipped during December is noted in reports issued by the Department of Commerce, Bureau of Foreign and Domestic Commerce, which lists $578,263 worth of such equipment shipped. November exports totaled $617,245 while October exports reached $678,727.

The Netherlands purchased the largest amount of aeronautical equipment during the month, its imports from this country reaching $56,225 represented in $5,824 for aircraft, $43,356 for engines and $6,945 for aircraft parts and accessories. Russia, whose purchases totaled $51,793, was the second largest buyer. Of the total, $32,788 was for aircraft parts and $19,005 for aircraft engines. Poland was the largest purchaser of aircraft engines, taking ten valued at $49,500, while China, spending $73,153, was the largest importer of aircraft. Mexico spent $19,235 and Honduras $28,227 on aircraft.

The total sales of aircraft came to $210,924. Aircraft engine exports were valued at $230,824 while parachutes and parts and aircraft parts and accessories reached a valuation of $136,251.

Air Meet Group Formed

GEORGE L. BAKER, formerly mayor of Portland, Ore., has been elected president of the Northwest Civic Air Meet Association, which will hold an air meet on Swan Island, June 30 and July 1. Dean Vincent was elected treasurer, Harry Coffey, secretary, and Larry Therkelsen, managing director. Honorary members are Governor Meier and Mayor Joseph Carson.

Rogers Reviews Air Controversy

AN INFORMAL presentation of the opinions of the principals in the air mail controversy was given by Will Rogers over station WEAF when he appeared on the Gulf Refining Company's program to speak as an aviation enthusiast.

Without offering any opinion, the Oklahoma sage told his listeners what he learned after talking with President Roosevelt, Postmaster General Farley, General Foulois and a number of army pilots. He also reported what former Postmaster General Brown, Col. Lindbergh and others had told him and concluded his talk by saying he took no sides in the controversy because, after listening to both sides, he could not tell who was right and that he still has no definite opinion as to what should have been done under the existing circumstances.

Digest of Recent Events

Plane Rescues 12 Stranded in Arctic

TEN WOMEN and two children were rescued from the camp of the marooned *Chelyuskin* survivors on the ice of the Arctic Ocean near the Bering Strait by Pilot Lapidevsky, who with Mechanic Petroff, flew a tri-motored ANT-9 from Cape Wellen and back. One hundred and one persons were marooned on the ice when the steamer sank on February 13 and now that the ice is beginning to break up the Soviet government is making every effort to make early rescues regardless of weather conditions.

MARCH 5.

Marsye Hilz Ends Second Asiatic Hop

THE FRENCH aviatrix, Marsye Hilz, completed her second Paris-Tokyo solo flight when she landed at Haneda Airport after flying from Seoul, Korea. Mme. Hilz left Paris on January 26. On her first flight, the French flier completed the 12,500-mile trip in 15 days and then flew back to Paris.

MARCH 6.

Douglas Sets More Speed Marks

TRANSCONTINENTAL & Western Air, Inc., is claiming a record for a passenger plane flight from Chicago to New York following a 3 hour 10 minute-flight in a Douglas airliner carrying 13 passengers and two pilots, averaging 236 miles an hour for the trip. This is the same plane which recently established a new transcontinental record of 13 hours for passenger planes.

MARCH 7.

Hawks in China to Demonstrate Bomber

A CURTISS CONDOR bomber, powered by two Wright Cyclone engines was being prepared for demonstration flights by Frank Hawks, who landed in Shanghai, China, as a representative of the Curtiss-Wright Export Corporation. Hawks will demonstrate the plane to the national government, which is building up its air fleet for both military and commercial purposes.

MARCH 7.

Ellsworth Plans New Antarctic Trip

UNDAUNTED BY failure of his Antarctic expedition of a few months ago, Lincoln Ellsworth may start another this fall, he said, but definite decision to return to the Antarctic will depend on whether or not the Northrop *Polar Star,* which was wrecked by an ice jam in the break-up of the ice pack in the Ross Sea, can be repaired in time. If this is possible, Ellsworth said he and Bernt Balchen, the pilot, will make another attempt to fly across Antarctica.

MARCH 11.

Automatic Balloon Gets Stratosphere Data

INFORMATION ON atmospheric conditions in the stratosphere may be obtained by the use of balloons which burst at prearranged altitudes and free instruments attached to parachutes. Russian scientists released these single-envelope, hydrogen-filled balloons and when an altitude of 11.5 miles is reached, they burst and automatically release a parachute which carries the instruments to the ground.

MARCH 13.

French Fliers Discover Queen of Sheba's City

CHANCE DISCOVERY of the lost capital of the Queen of Sheba was reported by Capt. Corniglion-Molignier and Andre Malraux, French aerial explorers who said they had flown over the legendary capital and found 20 towers and temples still standing. Condition of the terrain prevented them from landing, they said, but they intend to organize an expedition and return for excavations.

MARCH 9.

Swiss Fliers Plan World Flight

AN ATTEMPT to lower Wiley Post's speed record around the world will be made this spring by Lieuts. Paul Scharer and Albert Jucker of the Swiss Air Force. The fliers plan to use an American-made plane, making Zurich their point of departure. They hope to make the flight in ten stages with stops at Moscow, Khaborousk, Edmonton, New York and Harbor Grace among them.

MARCH 14.

Laura Ingalls Flies Andes Solo

LAURA INGALLS, New York aviatrix became the first American woman to fly solo across the Andes Mountains when she navigated her Lockheed from Santiago, Chile to Buenos Aires while on an aerial tour of South America. Two foreign women, the French aviatrix, Voland and the German flier, Bienbold, preceded Miss Ingalls in flying their own ships across these mountain ranges.

MARCH 21.

Coming Events

Entries for Wm. E. Boeing Scholarships close. Boeing School of Aeronautics, Oakland, Calif. APRIL 1.

International Show of Sport and Touring Aviation under auspices of Aero Club of Switzerland. Palais des Expositions, Geneva. APRIL 27-MAY 6.

Deutsch de la Meurthe Cup Competition. MAY 2.

Stratosphere flight under auspices of Army Air Corps and National Geographic Society by Major William Kepner and Captain Albert W. Stevens. Tentative date of take-off JUNE, 1934.

Coupe Mondaile d'Acrobatic Aerienne, international acrobatic competition at Vincennes, France. 300,000 francs in prizes. JUNE 9-10.

Distance and Endurance Contest for 100,000-franc grand prize and 5,000-franc cup. Sponsored by The Aero Club of the West of France in conjunction with the Aero Club of France, Angers, France. JULY 8.

Fifth Annual National Soaring Contest, Elmira, N. Y. JUNE 23-JULY 8.

Grand Prix of the Aero Club of France. Speed races between Deauville and Cannes and return for cash prizes and Armand Esders Trophy Cup. JULY 21-23.

Third Air Tour Around Italy. AUG. 1-15.

International Touring Challenge of the Polish Aero Club. AUG. 28-SEPT. 16.

Gliding and Soaring Contest, Big Meadows, Shenandoah National Park. SEPT. 15-30.

Gordon Bennett Balloon Race. Auspices of Polish Club, Poland. SEPT. 23.

MacRobertson Race, London-Australia. Speed race and handicap race. Under regulations of Federation Aeronautique International and competition rules of Royal Aero Club, 119, Piccadilly, London, W.I. Entries close June 1. OCT. 20.

Electra Wing Gets Static Tests

AN INTERESTING static test of the wing of the new all-metal Lockheed bi-motor transport was made recently in the presence of Department of Commerce officials.

The entire ship was turned upside down and loaded with lead and sand over the surface of the wing to the extent of the full dynamic force that it would receive if the pilot pulled back suddenly on the elevator control and zoomed the ship at 185 miles an hour. The actual load applied was 29,000 pounds, distributed over the wing and 10,000 pounds localized at the engine supports. Under the load, the maximum deflection at the wing tips was five inches, revealing rigidity from two to three times that normally experienced in airplane wings. Although partially relieved at intervals the wing supported almost the entire load in increasing increments during the period of the test and when the load was removed returned to its normal position. At no time was there an apparent overstress of any part of the ship and recorded deflections indicated stresses that were well within the elastic properties of the materials.

In addition, every portion of the completed airplane was subjected to a static loading equal to or greater than the maximum stress that it will receive in full flight maneuvers.

Douglas Agency to Cox-Stevens

EASTERN REPRESENTATION of the Douglas Dolphin and Douglas transport has been awarded to Cox-Stevens Aircraft Corp., 521 Fifth Avenue, New York, N. Y., by the Douglas Aircraft Corp., Santa Monica, Calif. According to Bo Sweeney, official of the sales agency, Cox-Stevens has orders for two new de luxe Dolphins, one purchased by Wm. K. Vanderbilt and the other by Wm. R. Hearst, Jr.

New Kinner Ready for Tests

TEST FLIGHTS of the new four-place cabin airplane being built by the Kinner Airplane & Motor Corporation, Ltd., of Glendale, Calif., will be undertaken in the near future after which the first plane will be delivered to a purchaser in San Francisco.

The new plane is powered by the C-7, the 300-horsepower engine recently produced by the company.

Five Kinner Playboys have been purchased by the Department of Commerce for delivery this month.

New Pilot Rules Not Retroactive

LICENSED PRIVATE pilots are not affected by the amended Air Commerce Regulations promulgated December 7, 1933, by the Department of Commerce, Aeronautics Branch.

According to Col. J. Carroll Cone, Assistant Director of Aeronautics, these pilots need only fill in the application blanks sent by the department a few weeks before expiration of their licenses. Although they must take the renewal physical examination, no flight test is required and, following an approval by the medical examiner, the application is mailed to the department. After that such pilots will not need to take the physical examination again for two years, renewal being accomplished by mailing the filled out application directly to the department.

Froesch Addresses S. A. E.

THE AERONAUTIC meeting of the Baltimore Section of the Society of Automotive Engineers was featured by a talk made by Charles Froesch of General Aviation Manufacturing Corporation who presented a paper entitled "Some Aspects of Commercial Aviation."

Fifteen illustrations, including interior and exterior views of aircraft and tables showing direct flying costs and airplane speed curves, were used by Froesch during his talk.

Stinson Names New Agent

A SALES agency for Stinson aircraft has been established in Oklahoma City following completion of a deal by James Brazell, local flier, and Jack Kelly, representative of the Stinson Aircraft Corp., of Wayne, Mich.

Brazell has purchased one of the new Stinson 1934 Reliants, a four-passenger, Lycoming-powered monoplane equipped with a Smith controllable pitch propeller and wing flaps.

Three Boeings Sold to Luft Hansa

REPRESENTING THE initial sale of American-made all-metal, low-wing, multi-motored airline equipment in Europe, three Boeing 247's twin-engined, 10-passenger P. & W. Wasp-powered monoplanes, have been purchased by Deutsche Luft Hansa, leading German airline company.

The Boeing will be used over the international route between Berlin, Paris and London and Richard L. Dobie, veteran United Air Line pilot, has sailed for Germany to instruct the Luft Hansa pilots in the operation of their new equipment.

While this is the first sale of multi-motored airliners of this type to a European country, single-engined transports, notably of the General Aviation and Lockheed types, have been used extensively in regular transport operations in Europe for some time, as has a Condor.

Long Beach Commission Formed

W. R. MARTIN was elected chairman of the newly organized Aviation Commission of Long Beach, Calif., to serve with C. C. McWhinney, C. R. Hornell, Capt. Harry Watson and Daniel Hoferer. In addition, Lieut. John K. Nissley, representing the Air Corps Reserve base and Lieut. Esten B. Koger for the Navy Air Reserve base were chosen advisory members. A CWA fund of $125,000 is being asked by the commission for improvements to the Municipal Airport.

Lockheed Reports Profit

A NET PROFIT of $25,691.74 after Federal taxes, depreciation and all charges was shown for 1933 in a report issued by Lloyd Stearman, president of Lockheed Aircraft Corp., Burbank, Calif.

Sales of single-engined Orion and Vega models amounted to $305,227.81, while repair and parts sales totaled $52,431.64. Unfilled ordered covered by definite signed contracts on hand in February, 1934, totaled approximately $256,500, and further substantial orders are expected following the successful termination of test flights of the Electra, Lockheed's newest transport.

The company, which began operations under its present management in July, 1932, showed a small loss during the last six months of that year.

(Continued on following page)

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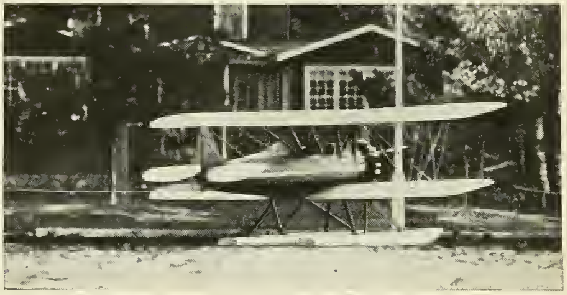

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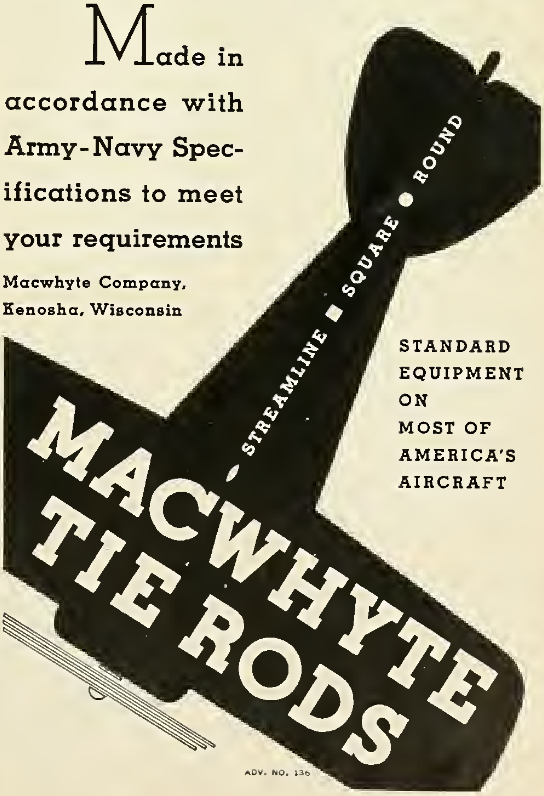

STANDARD EQUIPMENT ON MOST OF AMERICA'S AIRCRAFT

(*Continued from preceding page*)

Operators Seek Federal Aid

A MOVEMENT to bring government aid to aviation, particularly through lending financial help to student and sportsmen pilots as a means of bolstering the country's air defense is now under way.

Sponsored by the newly organized Independent Aviation Operators of the United States, more than 300 operators attended a meeting in Washington recently, when a program was outlined and presented to members of Congress in the hope of securing congressional approval at the present session.

The group seeks a government subsidy amounting to 25 per cent of flight tuition costs for students enrolled in flight training schools. Furthermore, it is proposed that $100 be paid to each private pilot who flies at least 50 hours in a given year and that the government pay up to one-third of the purchase price of any new approved plane sold to any citizen of the United States with the agreement that in time of national emergency, the government could commandeer the plane after reasonable payment to the owner. At present an intensive drive to enroll all aircraft operators in the new organization is being made.

Goggle Wearers Insured

FOR THE third consecutive year Lloyds of London, England, have issued to E. B. Meyrowitz, Ltd., an insurance policy in connection with their well-known Luxor goggles, whereby the wearer can claim damages from £1,000 to £5,000 for injury to or loss of an eye while wearing Luxor goggles fitted with safety lenses.

The policy covers all medical and/or oculists's expenses incurred in the event of injury to an eye or eyes or in the event of loss of sight of either eye caused by the splintering, while being worn, of any Luxor goggles and/or spectacle frames fitted with Triplex, Acetex or other Safety-glass lenses during the period of one year, after which time a renewal of the insurance may be obtained upon application to the manufacturer.

To date no claims have been made in connection with this insurance, a record for Luxor goggles, considering the many thousands in use, especially by officers in the Royal Air Force of England and in the Army Air Corps of the United States.

Douglas Constructing New Unit

WITH ONE $18,000 addition, started last December, now in use, construction on a second unit is progressing rapidly at the Douglas Aircraft Corporation's Clover Field plant. The new unit will cost $30,000 and will be located west of the main factory building.

It will be 125 feet wide by 297 feet long, 34 feet high at its highest point and of fireproof construction. No date has been set for its occupancy.

Douglas officials have also conferred with Santa Monica officials concerning the possibility of obtaining title to the remainder of the Ocean Park Blvd. front from the plant to 27th Street.

Fleets Sold for Export

FURTHER INFORMATION concerning the sale of fifty Fleet trainers to foreign governments has been released by Clinton P. Warner, sales manager of the Consolidated Aircraft Corp., Buffalo, N. Y.

The orders, representing sales of 30 for China and 20 for Roumania, are valued at approximately $200,000 and bring the total number of Fleet planes in China to 74. The planes for the Chinese government will be powered by Kinner B-5 125 h.p. engines, but those for Roumania will be equipped with the English DeHaviland Gypsy Major, 130 h.p. in-line, inverted, air-cooled engine, which is being manufactured in Roumania under license. While performance with the Major is about the same as that with the B-5, use of the latter shows slightly better take-off and rate of climb characteristics.

Production Shows Increase

FINAL REPORTS for airplane and engine production and deliveries during 1933 prepared by the Aeronautical Chamber of Commerce on monthly reports received from member manufacturers indicate that all production increased 16.7 per cent and all deliveries increased 11 per cent over 1932. While military airplane and engine values together dropped 12 to 15 per cent, commercial airplane and engine production and deliveries were double those of 1932.

Total aircraft production reached 1,057 units, while 1,980 engines were manufactured during the year. Total deliveries during 1933 reached 1,072 aircraft units and 2,002 engines. Valuation of all aircraft and aircraft engines produced for the year was $15,965,543 and $9,710,622 respectively, or a grand total of $25,676,165. Value of all aircraft and aircraft engines delivered was $15,705,936 and $9,648,847 respectively, making a grand total of $25,354,783.

Commercial production and deliveries, both aircraft and engines, exceeded military production and deliveries, with 591 commercial and 466 military planes and 1,120 commercial and 860 military engines being produced during the year. Deliveries of commercial aircraft and engines were 604 and 1,135 units respectively while military aircraft and engines delivered totaled 468 and 867 respectively.

All military production equalled 57 per cent of the total value of all production, compared with 76 per cent in 1932; commercial production jumped from 24 per cent in 1932 to 45 per cent in 1933.

YEAR OF THE SEA SERPENT

(*Continued from page 26*)

think he's been misled in several matters besides aviation. He's going to drive into a few more dead-end streets, but I also think that he's going to grin and back out, good-naturedly. He never claimed to know every foot of the road ahead, anyhow. Even Babe Ruth has been known to miss the ball occasionally. Let us be patient with the President, and let him be patient with us; we're all just folks, struggling along together, making mistakes, going along, stumbling, striving, hoping, trying to do the best we know how in our various spheres. And most of us are tolerably honest, too. Even old Jim isn't so bad—he might be worse. I don't see how he could be, but maybe that's just my prejudice.

Shucks! This Air Mail thing will be ironed out in due course. As my old father used to say when we were kids, and there wasn't anything to eat in the house, "A way will be found; the Lord will provide. Be patient." Then he'd go out, some one would buy him a drink, and any worries he had would vanish. He was a philosopher.

Anyhow, boys, this is the year when the sea serpent was seen in Loch Ness, and when Ruth Elder wasn't requested to tell the Senators all she knew about aviation. Now you'll admit, in a crazy year such as this, *anything* can happen. In a mad year like this I wouldn't be surprised if, after practically ruining the Air Mail, the Administration finally decided to let it go on again. They don't even have to admit they were wrong. They can just blame it on the sea serpent.

But Air Mail, after all, is only one phase of our entertaining national life. In all the furore about Air Mail we've almost been forgetting what has happened to the Army Air Corps. The boys have been given whistles, and are going around as postmen. I hope nobody attacks us at this disconcerting moment. They've taken the machine guns and bomb racks off the war planes and turned them into post-office trucks.

But that isn't the half of it. They're going to examine the ocean mail contracts. It is hinted that there has been collusion, or collops, or something. If so, what are we going to do?—cancel the ocean mail contracts and send the mail by battleship? Now, there's an interesting idea. Suppose a war breaks out and all our battle-wagons are full of mail in Liverpool and Havre and Tokyo and Naples. What are we to do then? Just imagine an American Admiral trudging up the street to the Tokyo postoffice with a bag of mail over his shoulder, the day Japan goes to war with us. Impossible, you say? Listen, brother, this is the year when the sea serpent was seen in Loch Ness. *Anything* can happen, so long as it's silly enough.

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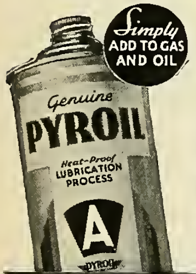

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FOREIGN NEWS IN BRIEF

Australasia

EIGHTEEN HAWKER *Demon* general purpose aircraft have been ordered by the Commonwealth Government at a cost of £106,000. Delivery is scheduled after test flights and acceptance trials have been completed. The planes will be powered by Rolls Royce Kestral engines and the order includes spare engines, spare parts, tools and special materials used for repair or rebuilding.

MORE PASSENGERS flew with Qantas, Ltd., during December, 1933, than did for three years, bookings from the west for the service becoming so heavy that another section had to be added to the Longreach-Brisbane route.

EVERY PERSON who travels to Australia via the Singapore-Darwin air route will have to be vaccinated against smallpox before arrival in the country, it was decided by officials of the Federal Health Department after consultation with authorities of other countries over which the Anglo-Australian line will fly.

DOMINION AIRWAYS CO. was recently formed and will operate a number of scheduled New Zealand air services in the near future. Among the routes to be operated are those between Auckland and Dunedin and between Auckland and Nelson. The 900 miles between Auckland and Dunedin are to be flown in 7 hours 45 minutes with four trips initially scheduled and daily service planned later on. Wackett-Codock monoplanes are being considered for use over the route.

DEFINITE ADVANCES in the development of aviation in New Zealand are evidenced in the 1933 report of the New Zealand Aero Club which is now composed of ten subsidized units located at Auckland, Hastings, New Plymouth, Wellington, Masterton, Blenheim, Christchurch, Greymouth, Dunedin and Invercargill.

THE STATE airport at Cairo, recently lighted, is now ready for night operations. It measures about 3100 by 2150 feet with the surface of hard sand. Lighting facilities consist of a neon beacon of 12 28-foot tubes, eight of which are visible from any direction; floodlights, boundary lights, lighted wind-direction indicator and a lighted wind velocity indicator.

Canada

THE TORONTO Flying Club airport has been approved as a temporary public customs airport. The club is now making daily observation flights for the Meteorological Service; has obtained a Puss Moth with the assistance of Imperial Oil, Ltd., and has equipped one of the Gipsy Moths with a cabin enclosure.

DESPITE A general reduction of the Dominion's budget, the Royal Canadian Air Force will enjoy an increase of more than $400,000 in the coming fiscal year.

A NEW SCHEDULE of rates and charges for hangar rentals and operations has been approved by the Vancouver, B. C., airport committee. For the smaller training aircraft and one-place passenger planes, hangar rentals are lower, but remain the same for the larger transport types.

Czechoslovakia

THE CENTRAL PILOTS' school connected with the Prague Aero Club, has just completed a most successful year. With 22 students, two of whom are women, the organization registered 5,333 flights during 1933 and plans to introduce courses in acrobatic and night flying during this year if proper flying equipment can be procured. Since its inception four years ago, the school has trained 53 pilots and logged 17,907 flights in 1,335 hours.

The 170 m.p.h. D. H. 86, Gipsy-powered airliner for Imperial Airways

France

AN INTERNATIONAL acrobatic competition called Coupe Mondaile d'Acrobatic Aerienne, has been organized by two prominent French newspapers and will be held at Vincennes, near Paris on June 9 and 10. Prizes totaling 300,000 francs will be divided among winners of first, second and third places.

Entries are reported to have been received from Al Williams, Detroyat of France, Fieseler of Germany, Colombo of Italy, Staniland of Great Britain, Orlinsky of Poland, Hansen of Denmark and Van Damruch of Belgium.

PAUL CODOS and Maurice Rossi, French pilots and co-holders of the world's long distance flight record are preparing to make another flight during which they will attempt to better their own record by flying from France toward South America. Their record was made last August when they flew from Floyd Bennett Field, New York, to Rayak, Syria, a distance of 5900 miles. Fueling arrangements have already been completed for the fliers at Natal, Rio de Janeiro and Buenos Aires, according to Major E. E. Aldrin, head of the aviation department of the Colonial Beacon Oil Company. Rossi and Codos intend to fly the same Bleriot plane with a 600-horsepower Hispano Suiza engine in which they made their present record.

AN INTERNATIONAL contest for distance and endurance will be held at Angers, France, on July 8 under the auspices of the Aero Club of the West of France and the Aero Club of France. Prizes include a 5,000-franc cup and 100,000 francs in merchandise.

Germany

EXTENSIVE PLANS for improvement of German international air traffic this year are now under way and Deutsche Luft Hansa had tentatively adopted a program of expansion.

First, regularly scheduled air service to South America will be maintained via the S. S. *Westphalen,* stationed in the south Atlantic. Preliminary flights having been considered successful, scheduled operations will undoubtedly continue along the same route which was via British Gambia to the *Westphalen,* 820 miles off in the Atlantic, and to Natal, Brazil. While the scheduled service is in operation, further test flights will be made in an endeavor to eliminate the mid-ocean stop, and flying boats capable of covering the 1,864 miles with cargo are under construction. Traffic between Germany and

(*Continued on following page*)

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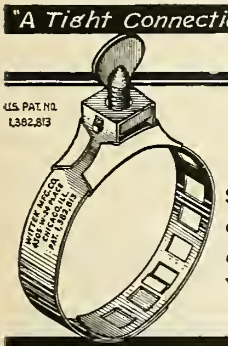

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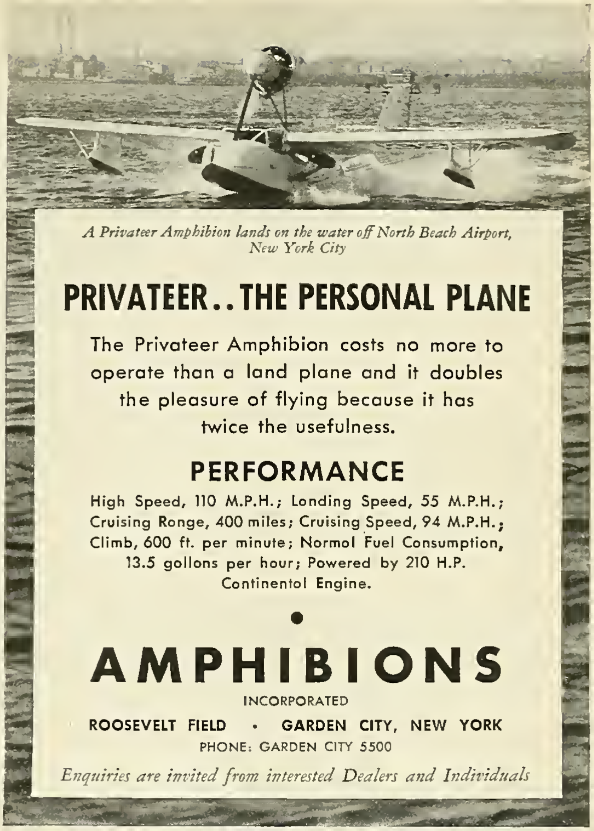

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(Continued from preceding page)

other European countries will be improved over existing routes with the addition of another flight between Berlin and London. Night air mail services are to be extended and lighting installations are being made on a number of routes.

Twenty-four JU52's, a fast tri-motored transport, will be placed in service this year and the He17, tried out originally as a mail plane, will be pressed into passenger service to lower the airline time between Berlin and Frankfort. The old Ju13 type is to be abandoned and will be replaced by Ju60's, fast single-engined planes.

TEST FLIGHTS of the LZ129, newest German dirigible, are expected to take place in the very near future since the metal framework is practically completed and only the installation of the engines and the equipping of the navigation rooms and living compartments remain to be done.

SERVICE BETWEEN Berlin and Moscow has been resumed following suspension during the winter months. Flights for the first three months of the year have been on a daily schedule, with one trip each way. Fares and express rates have been reduced over those charged in 1933.

Great Britain

THE D. H. 86, four-engined biplane and latest of Imperial Airways' planes, was recently put through a series of tests at Stag Lane Aerodrome before being delivered and put into operation over the Singapore-Darwin-Cootamundra sections of the main England-Australia air route. This plane is equipped, with four Gipsy Six engines of 200 h.p. each, mounted on the lower wings, and carries 10 passengers in addition to a crew of two. It is intended to provide a replica, in miniature, of the larger four-engined transports now in use by Imperial Airways.

Performance tests indicate a top speed, with full load, of 170 m.p.h., cruising speed of more than 145 m.p.h., and a landing speed of 66 m.p.h. Tests were made to determine the propeller efficiency of the inner and outer pairs of motors (there are two engines on either side of the fuselage). Propellers were removed from the two inner engines and then the two outer engines and the plane flown under each condition. During these flights the plane carried 80 gallons of gas and a total weight of 6,940 pounds consisting of one passenger, 260 pounds of ballast and the weight of the two "dead" engines and their installation gear. In all, the load was equivalent to nearly 1500 pounds of payload, in addition to fuel and oil sufficient for a non-stop flight of more than four hours. Under these circumstances the plane reached a maximum speed of 127 m.p.h. and the take-off met international requirements in duration and rate of climb.

THE NEW AIRPORT rapidly nearing completion at Dyce, Aberdeenshire, in Northern Scotland, will provide a three-plane metal hangar, a pavilion and other facilities. Four private companies are planning to operate from the field; Aberdeen Airways, Ltd., in taxi and charter work; Aberdeen Aerodrome Fuel Supplies, Ltd., in selling fuel, oil, cleaning materials, etc.; Aberdeen Flying School in administering the field and operating a flying school and Aberdeen Flying Club, in maintaining the pavilion as a club house and fostering club flying.

ANOTHER ENTRANT for the London-Melbourne air race in October of this year is A. O. Edwards, managing director of a leading London hotel, who has ordered one of the de Havilland *Comet* racers for C. W. A. Scott and T. Campbell Black, two well-known pilots. Little is known about the *Comet* plane except that it will carry a crew of two, is capable of a top speed of at least 200

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m.p.h. and will comply in every detail with the conditions governing the MacRobertson race.

THE FLYING trophy awarded annually for efficiency in instrument flying at the Air Service Training School was won by T. C. Wallace, who is now obtaining the necessary instruction for advanced flying. The method of instruction at the school follows somewhat similar practice in this country, with the student learning to fly by instruments in the hooded cockpit of an airplane in flight.

AT LYMPNE, England, recently, Sir Philip Sassoon, Under Secretary of State for Air, officially opened the commercial Micro-Ray radio service between the civil airports at Lympne, Kent and St. Inglevert, France. This service is being jointly provided and operated by the British and French Air Ministries to speed-up transmission of essential traffic messages between the two stations. It will replace the present system which entails some delay as messages pass by land line from Lympne to Croydon and are then transmitted by wireless telephony to St. Inglevert. The new device is the direct outcome of successful experiments of two-way telephony using a duplex telephone circuit that is capable of operating on a commercial basis on an 18 cm. wavelength.

AIRSPEED, LTD., has appointed R. K. Dundas, Ltd., its agents in India and Burmah, and one Airspeed Courier, six-passenger monoplane powered by a 260-horsepower Armstrong Siddeley *Cheetah* engine has been delivered to the company. The Courier has a patented hydraulic retractable landing gear which when drawn in is said to add considerably to its top speed bringing it in the neighborhood of 170 miles an hour. The plane has a span of 47 feet, length of 28½ feet, height of 8¾ feet and a range of 700 miles. It features quick take-off and climb, performance tests showing a 120-yard take-off and a 10, 000-foot climb in 12 minutes with a 3,500-pound load.

Holland

AN EVENT which recently occasioned considerable interest was the record-breaking trip made by a tri-motored Fokker belonging to K.L.M. from Amsterdam to Batavia and return. Manned by a crew of four, the plane covered the outgoing mileage in 4 days 4 hours 40 minutes and returned in 4 days 4 hours 30 minutes, the entire flight consuming more than 17,000 miles. Ordinarily, the trip takes 9 days, but since no mails or passengers had to be picked up en route, the pilots were free to choose their daily stages. Three P. & W. Wasp engines powered the plane which was a regular service machine pressed into service at the last hour due to mechanical difficulties in the ship originally intended for the flight.

Russia

FOURTEEN MORE airplanes have been assigned to the Soviet Red Cross for utilization in sanitation work. They vary from the two-place Y-2 to the larger types like the K-5 and SH-5 and are featured by modern sanitation and medical equipment.

ACCORDING TO preliminary figures of the federal budget of the U. S. S. R. for 1934, there will be an investment of 225,300,000 rubles (nominally $112,650,000) in civil aviation.

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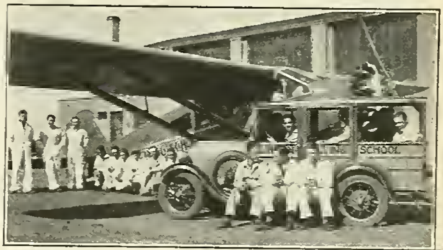

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7. Stinson literature describes, for potential purchasers, dealers, etc., the latest model with "Selectiv-Glide" and other features. Write for it..........Page 71

8. Hammond aircraft offers an improved three-place biplane, at a reduced price. Write for the catalog........Page 69

9. The Vought "Corsair" literature is available to the aeronautic officials of the United States and foreign governments ....Page 63

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ENGINES

12. Aeronautical engineers, manufacturers, operators and government officials are invited to write for the Pratt & Whitney booklet...Back Cover

13. Private fliers, aircraft manufacturers, engineers—let Jacobs Aircraft Engine Co. send you their data concerning the new 225 h.p. Jacobs engine offering battery ignition and other advantages ......Page 9

14. The Wright Cyclone and other Wright engines are described for engineers, aircraft manufacturers, aircraft operators here and in foreign countries ....2nd Cover

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15. Aeronautical engineers concerned with insulating problems are urged to write for a copy of The Felters Co. literature on the use of felt in aircraft ....Page 77

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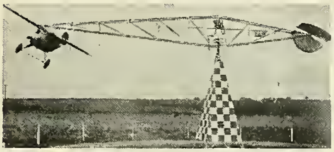

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ARROW SPORT: Kinner motor; excellent condition, real buy, $475. Also Kinner, LeBlond parts. Arrow Sport parts. Herb Putnam, Arrow Airport, Lincoln, Nebraska.

FOR SALE: Waco four-place cabin, late 1933 model; flares, landing lights, radio; total flying time, 75 hours. Will sacrifice. AERO DIGEST, Box 1743.

SIKORSKY: Twin-motored, latest type. Just completely overhauled. Will sell at sacrifice or consider any proposition. Excellent condition. Never cracked. AERO DIGEST, Box 1745.

OX-5 TRAVEL AIR: In excellent condition. Silver wings, red fuselage; brakes, dual controls, Scintilla magneto, Miller overhead. Also extra motor. No time on either motor since complete overhaul. Always privately owned; never cracked. Only cash offers considered. Jack Lenkard, c/o Kendall Refining Company, Bradford, Penna.

J-5 STEARMAN: Excellent condition. Forty hours since recovering and major overhaul. Metal propeller, brakes, turn and bank indicator, air speed. $1,200. Art Chester, Joliet, Illinois.

FOR SALE: Birdwing, Wright J-6-5 motor. Three-place open biplane, good condition. NC licensed until October 15, 1934. Price, $900. Rodney L. Mills, Osage, Wyoming.

MONOCOUPE: Lambert motor. Like new, with new type gear, wheel pants, ring, steel prop, navigation lights, cabin heater. $1,500 cash. Harold Neumann, Moline, Illinois.

MONOCOUPE VELIE: Late '29; late engine; perfect; unlicensed Waco, J-4B engine; ship perfect; trade for car. Retail Sales Co., 350 Bremer Arcade, St. Paul, Minnesota.

FOR SALE: Waco Cabin, '32 model, excellent condition, Kinner 210, licensed; red leather, steel prop, pants, ambulance equipment, etc. Priced to sell; demonstration with deposit. Write or wire J. T. Moore, Jr., Reading, Pennsylvania.

BIRD: Kinner K-5, just overhauled, front exhausts; semi-airwheels, brakes, air speed, fabric excellent, $1,125. John O'Leary, Room 776, 208 South La Salle, Chicago, Ill. Franklin 7171.

PRIVATEER: Warner; Pitcairn Gyro, Kinner; J-5 Waco; Challenger Travel Air; Kinner Eagle; OXX Command-Aire. Very best condition, low prices. Charley Raudabaugh, 13210 French Road, Detroit, Michigan.

LE BLOND MOTOR: 85 h.p. Complete; A-1 condition; $150. Also new Paragon prop for same, $20. Fred Vilsmeier, 857 East Luzerne Street, Philadelphia, Pennsylvania.

CURTISS-WRIGHT JUNIOR: Motor just overhauled; all ribs strengthened; ship just recovered. Never cracked, always hangared. $395. D. C. Fonda, 175 Fifth Avenue, New York, N. Y.

JACOBS 170 H.P. MOTOR: No hours; new type; guaranteed. J. McPherson, Abington, Pennsylvania.

STEARMAN C3R: J6-7. New type clutch. Ship and motor excellent. Instruments both cockpits; speed ring, metal front cockpit cover, airmail windshield rear cockpit. Total time 500 hours. AERO DIGEST, Box 1752.

EAGLEROCK J-5: Always used privately; 278 hours; never damaged; steel propeller, Bendix brakes, compass, navigation lights, cost over $6,500. Sell reasonable offer. Rearwin Jr.: Powered with 45 Szekely, 67 hours since new; completely refinished, air wheels, duals, $575. 65 Moeller Avenue, Buffalo, New York.

FOR SALE: Warner 125 h.p. motor in excellent condition, latest type; $450 for quick sale. Michigan Aero Motors, Jackson, Michigan.

WACO CABIN: Continental A-70. Excellent condition. Just had major. Exceptional bargain, $2,250. The H. C. Robbins Co., Waco Distributors, Cleveland Airport, Cleveland, Ohio.

TRAVEL AIR: Warner 110. Ship completely overhauled and recovered last August. Sixty gallons gasoline; steel propeller, adjustable parachute seat, brakes, baggage compartment, navigation lights, bank and turn. Motor, 15 hours since overhaul. Ship and motor in excellent condition. Privately owned; never cracked. Only cash offers considered. Jack Lenkard, c/o Kendall Refining Company, Bradford, Pennsylvania.

R-1750 CYCLONE motor: Practically new. Complete less magnetos, $200. Rising Sun Motors, H and Luzerne Streets, Philadelphia, Pennsylvania.

STINSON R: DeLuxe, Just relicensed. Can't be told from new. Complete instruments; new battery; landing lights; duals, etc. Never cracked. $2,895. Wesley Airport, Wesley, Iowa.

SELL OR TRADE: Stinson 33 h.p. Six-place; has ATC for floats. Travel Air 175 h.p., model E-4000. Driggs Skylark, powered with Rover 75. Cavalier Lambert Coupe. Travel Air OX stressed for J-5. Sell with either motor. Waco OX. Lincoln Page OX. All in A-1 condition. Central Air Service, Grand Rapids, Michigan.

BARGAIN FOR $850: Spartan 3-place open, J6-5, metal propeller, booster, full set instruments, 65 gallon tanks. Recently recovered. Licensed next July. Airview Flying Service, Red Bank, N. J.

FOR SALE OR TRADE on late model Stinson or Waco C: Inland Sport, Warner 110; licensed to May 1; motor recently major overhauled; covering excellent; Townend ring, plenty instruments. $1,000 cash. S. D. Marett, Jr., Navasota, Texas.

FOR SALE: J-5 Travel Air cabin; six-place; good condition; real money maker. J-5 Eaglerock; A-1 condition, with speed ring and tail wheel. Both ships NC licensed. Reasonable. L. P. Quinn, Miles City. Michigan.

OX-5 MOTORS: Just purchased from the Government. Guaranteed brand new and complete. Shipped privilege inspection. Reasonable price. Grant Marine Motor Co., 827 Whittier, Detroit, Michigan.

FOR SALE: Curtiss Junior. Wanted: Challenger motor and prop with Robin mount. LeBlond 60, Challenger Robin parts; Aeromarine Klemm. Ray Vaughan, Box 490a, R. D. 5, Akron, Ohio.

KELLETT AUTOGIRO: 210 h.p. Ship and motor in excellent condition. Fully equipped for sky sign towing. AERO DIGEST, Box 1753.

WACO STRAIGHT WING: J6-7; completely streamlined; perfect condition. 300 hours total; 25 hours since last overhaul. Demonstration available any time. For startling sale price call or write Ray Kuser, Mercer Airport, Trenton, N. J.

STINSON JR.: J-5. Licensed November, 1934. Rate climb, turn-bank, anti-drag ring. Best offer over $1,000. Siemens 113 h.p. Kitty Hawk, excellent condition. Sacrifice, $650. Also J-5 parts. Tyne, 212 Court St., Binghamton, New York.

WACO F: Damaged; $500. Lincoln Page, $85 less motor. Bird, $595; Warner Travel Air, $800; Exhibition chute, $25. Hundreds of others. OX ships, $110 up flyaway. Owner's price, name and address. Send $1 for six months or 25c for sample copy. Used Aircraft Directory, Athens, Ohio. List your ship with us.

CURTISS ROBIN: Newly refinished and licensed; excellent OX-5. Beautiful job. Attractive price for quick sale. Instruction included if desired. Carl Hanson, 1505 Florencedale, Youngstown, Ohio

CIRRUS ENGINES: (English Mk. III) 97 h.p. at 2,100 r.p.m. Brand new in original crates; approved by Dept. $250. N. W. Perdew, Hasbrouck Heights, New Jersey.

CONTINENTAL MOTOR 165: Equipped with Heywood starter, steel propeller; less than 160 hours. Excellent condition. Shipped free east of Mississippi. Becker Aircraft Sales Company, Dravosburg, Pennsylvania.

BARGAIN: J6-9 Ryan, 260 hours, $1,375. J-5 Stearman, like new, $1,250. Challenger Travel Air, excellent condition, $1,100. Warner Aristocrat, extras, $900. Also Sikorsky 38 and Lockheed Sirius and Air Express. Aero Brokerage Service of New York, Roosevelt Field, Mineola, New York.

FOR IMMEDIATE SALE OR EXCHANGE: 14 certified airplanes, as follows: J6-9 330 h.p. Straight Wing Waco; J-5 220 h.p. 3-place Pitcairn; 2 J-5 220 h.p. 3-place Travel Airs; 75 h.p. 2-place Driggs; Warner 125 h.p. Inland Super Sport; OX-5 Travel Air; OX-5 Robin cabin ship; J6-7 250 h.p. Taper Wing Waco; Warner 125 h.p. 4-place Cessna cabin ship; Kinner 100 h.p. Fleet; J-5 220 h.p. Straight Wing Waco; Wright Cyclone-powered trimotor 20-passenger Patrician. All ships in excellent condition throughout. Photographs furnished if you mean business. Will accept good late model cars on deals. Terms to responsible buyers. Buy now, before prices advance. Call, write or wire. Becker-Forner Flying Service, Inc., Jackson, Michigan.

RYAN B-5: Six-place, J-6 330; Robin J6-5; New Standard Trainer, Kinner; Bull Pup Szekely (modernized); OXX-6 Waco; Ryan B-1, 5-place, J-5. All ships in excellent condition, licensed. Chuck O'Connor, Barnes Airport, Westfield, Mass.

WACO F: Warner 125 h.p., motor just major overhauled; wings and tail group recently recovered. Looks and runs like new; always hangared and flown by transport pilot. Motor equipped with special speed propeller; ring, Heywood starter. Ship equipped with streamlined metal front cockpit cover, bank-and-turn, special rear windshield, duals and brakes. $1,550. Parrish Flying Service, Columbia, South Carolina.

TRAVEL AIR E-4000: J6-5. 198 hours; motor modernized; 90 hours since complete overhaul. Fully equipped; dual controls; like new. Harold Jenks, 673 Locust Street, Mount Vernon, New York.

FOKKER Standard Universal: J-6 300. 7-place. 350 hours total time. Never cracked, always hangared. Pants, ring. Absolutely perfect. $3,000. Will consider Taperwing Waco, Stearman or Pitcairn. Balance cash. AERO DIGEST, Box 1755.

OX-5 CHALLENGER: Black and silver, semi-airwheels, Scintilla mag; licensed December. $495. Tank Waco, good condition, $775. J-5, J6-7 mags cheap. Philadelphia Aircraft, Municipal Airport, Philadelphia, Pennsylvania.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

Used Planes and Engines

FOR SALE: Continental 210 h.p. engine, complete with starter. 35 hours since new. $650, or trade for two-place ship. Wanted: 60 h.p. Anzani. H. B. Taylor, Las Vegas, New Mexico.

FOR SALE: Three J-5 Standards. Will consider trades. Prefer Waco F, Warner Coupe. Wanted for cash: Taylor Cub, Aeronca. Jack Alrutz, Schenectady, N. Y., Airport.

BIRDS OX-5: Kinner Eagle, $750; Waco 10, $375; Lycoming Stinson, $1,550; Arrow Sport, Challenger Robin. Used airplane parts; will trade. Pioneer Aviation Company, c o Airport, Syracuse, N. Y.

ENGINES: New seven-cylinder Jacobs; new Inverted American Cirrus; used J6-5. Slightly used Heywood starter for five-cylinder engine, $75. Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

FOR SALE AND TRADE: Certified used and reconditioned ships of all types and makes, at almost your own prices. Write for list. Omaha Aircraft Brokerage Service, South Omaha, Nebr.

FLYING BOAT: Curtiss four-place, completely rebuilt ship and motor, licensed. No time since overhaul. Beautiful sporty job. Roger Pennock, 501 Cooper Street, Camden, New Jersey.

GREAT LAKES 2T1E: DeLuxe model; inverted engine; steel propeller; all extras; recently overhauled at Cirrus factory. Perfect condition, $1,000. AERO DIGEST, Box 1758.

CHALLENGER KR-C5: Warner 125; just completely overhauled; brakes, speed ring, $1,000. Waco 90, OX-5, spare motor, $800. Both entirely recovered, glossy finishes, duals, extra instruments, exceptionally good condition. Trade either for Aeronca or Taylor Cub. Weonit Flying Club, Quincy, Massachusetts.

STINSON LYCOMING: Licensed until February 1935. Only 250 hours. Complete night and blind flying equipment; $1,500. D. C. Fonda, 175 Fifth Avenue, New York, N. Y.

KINNER FLEET, $980; motor excellent, covering fair, licensed September '34. Also American Eagle, J6-5; $1,435; equipped blind flight, hood, bank-turn, airspeed, Kollsman, navigation and instrument lights, balloon tail wheel. Excellent shape. Dick Schall, Berwyn, Maryland. Telephone: Berwyn, 70.

CURTISS-WRIGHT JR.: $475. Curtiss Robin; OX-5, $550. Waco F: Warner 125, steel propeller, ring, $1,750. Great Lakes: All recovered and overhauled, air wheels, $950. Command-Aire: OXX-6, air wheels, $625. Waco 10: New Tank motor, 22 hours time, cost $1,000; sacrifice, $875. Waco C: Continental 165, ship like new, $2,200. Fleet Trainer: Kinner, now being completely reconditioned, $1,450. Angelo Deponti, Wold-Chamberlain Airport, Minneapolis, Minnesota.

SALE OR TRADE: Kinner 100 h.p. 3-place American Eagle. Fine condition. Licensed, extras. $650. Consider light auto. Shop, 610 Penn Ave., No. Minneapolis, Minnesota.

GREAT LAKES: New engine, airwheels, brakes; Fleet 125 h.p. Kinner B-5, just overhauled; Aeronca C-3, new 1932, excellent condition. Ships priced to sell. Air Activities Airport, West Chicago, Illinois.

PITCAIRN AUTOGIRO: Like new, 50 hours time; Kinner motor, starter, brakes, lights, steel propeller; sacrifice, $2,000 cash. Stored Hadley Airport, N. J. AERO DIGEST, Box 1763.

FOR SALE OR TRADE: J-5 Ryan, 5-place cabin, licensed, excellent condition, $1,500. Waco 10, licensed, $485. OX Robin, $650; new motor, ship recovered. A-40 Taylor Cub, $650. Box 91, Chesapeake, Ohio.

AMERICAN EAGLET, Salmson 40 h.p. Licensed to July 1934. Dual controls, good fabric, never cracked, $700. American Eaglet, Szekely 45 h.p., licensed to April 1935; engine time, 300 hours, never cracked; dual controls, $700. Jesse Jones Airport, Lancaster, Pennsylvania.

TRAVEL AIR: Two-place, Gipsy, licensed, original paint; always hangared, condition perfect. $1,000 cash. R. C. Cranford, Raleigh, North Carolina.

FORD J-6: Ship time 1600 hours; motors approximately 900 hours. Gas capacity 6½ hours cruising. Spare motor and spare prop. Price $9,000. C. E. Corson, 74 Meadow St., Stratford, Connecticut.

Miscellaneous Products & Equipment For Sale

THIS MONTH'S BARGAINS: All or part of two latest model R-1820-F motors, total time 20 hours, including 3-blade propellers. Wasp B motors, good condition, $650 each. New Kinner crankcase, $30. Hisso, Liberty, Hall-Scott and all water-cooled motors, best offer. Standard Steel propellers, $30 to $75. New 24x4, 28x4, 30x5, 26x5, 32x6, 36x8, non-skid straight side casings, $3 to $6 each. 48x12, $11. 750x125, 900x200, $5 each. All tubes, 65% off. Small 14x3 industrial type, four-ply tires, tubes with disc wheels, $9 and 20x4, $11. New altimeters, $2 and $3 each. Luminous dial oil gauges, 120 and 200 pound pressure, $1 each. Six-pound fuel gauges, 75c. Distance thermometers, best quality, $2.50 each. Sixteenth-inch waterproof birch plywood, 4′x40″, $1 per sheet. Best quality Flightex fabric, 35c per yard. Flightex tape, $2.50; good tape, $1.50 per 100-yard roll. Bendix wheels, with and without brakes. All sizes wire wheels from $1 up. 850x10 wheels, with or without brakes. Tail wheels from $1 to $5 each. Inertia starters, $10 to $25 each. Nickel steel bolts, aluminum and turnbuckles at exceptionally low prices in quantity lots. Ten absolutely brand new 60 h.p. Siemens-Halske motors in original crates, latest model dual ignition, $250 each. 400 rubberized weather-proof flying suits with zippers, all sizes, brand new, $3.75 each; cost Navy $26. 30 brand new Hornet crankshaft assemblies, complete in original boxes, $30 each. 300 new Hornet piston assemblies with rings, $5 each. New valves, $6. Cam, timing, blower and all other gears, thrust, roller and all bearings. Master rod assemblies, pins, bushings, everything for Hornet motors, brand new, 80% off list. 20 assorted brass gas line fittings, any size, $1. B. G. and Mosler spark plugs, new, 50c. AC, Champion, Splitdorf, other types new spark plugs, 25c each. New Johns Manville, Reliance and Jaeger and other makes of tachometers, $5 each. Throttle controls and chokes, 50c each. 6,000 pounds, 18 gauge sheet duralumin, 40″ by 14 ′, and 16 gauge soft sheet aluminum, 4′x12′, at 35c per pound. Nickel steel shackles, large sizes, quantity lots, 3c each. Roebling stranded cable, various sizes, quantity lots, 2c per foot. Machine gun cameras, $20 each. Sperry compasses, $5 each. Perfection wind cones, 30″x96″, $7 complete; internally lighted, $9. One silk Irvin seat pack, practically new, $100. Cirrus, Moth, LeRhone, Lawrance and Velie motors cheap. OX-5 pistons with rings, $1.35; valves 30c; bearings, rocker arms, crankcases. Make us an offer. See us for bargains. If it flies we have it. Crawford Airplane Supply Company, 350 Washington Boulevard, Venice, California.

HANGAR: Brand new, steel, portable. 40 x 40. Electricity, pumps, lockers. Trade for good plane or cash. J. McPherson, Abington, Pennsylvania.

BROTHER, CAN YOU spare a dime? If you can, send it to me and I'll send you my 1934 Low Priced Aviation Material Catalog. Karl Ort, 709 W. Poplar, York, Pennsylvania.

SAVE YOUR Kinner and Warner cylinder heads from cracking by installing our reinforcing head studs, 500 hours guarantee; hundreds of successful installations; $3.50 each. Express your cylinders or fly in; 24-hour service. Motor replacements, new parts, large stock standard and oversizes; bearing rebabbitting and finishing. Engines bought, sold and overhauled. Write us; save 30% and 60%. Sale on OXX-6 new parts: upper case, $9.50; cylinders, $1.95; pistons, $1.; rings, 10c. All new. Aristocrat wings, covered, $30; uncovered, $10. Wire wheels, 26 x 4, $1.; 30 x 5, $2; all new. Air Transport Equipment, Roosevelt Field, Garden City, New York.

NEW ELECTRIC direct-drive Bijur starters for Wright J-5 engines; $40. Will ship on ten days free trial. Aero Salvage Co., Glenn Curtiss Airport, Jackson Heights, New York.

LOCKHEED PARTS: Eastman wings; Ryan B-5 motor mount; Model A Eaglerock parts; latest Waco C right upper; Waco F-2 center section, right upper. Charley Raudabaugh, 13210 French Road, Detroit, Michigan.

FAIRCHILD AERIAL CAMERA outfit: Model 14. Completely reconditioned and refinished. Includes: 1 long cone, 25 cm. f4.5 Zeiss Tessar in shutter; 1 short cone, 18 cm. f4.5 Zeiss Tessar in shutter; 1 magazine with shutter set and release; exposure counter; 1 extra roll film holder; all packed in special heavy fibre trunk. Special, $195. Value, $1,200. M & H Sporting Goods Co., 512 Market St., Philadelphia, Pennsylvania.

SELL CHEAP or trade for car: Unlicensed 3-place seaplane, J-5 motor, sound, complete with lot of spares; set up ready to fly; single float type; photo on request. Wasp pistons, $4 each; Century Cyclone outboards, new in crates, $60. Almost new Dodge 16 ft., 25 m.p.h., $350. Liberty, Hisso, OX, J-5, Hall-Scott and other motors. New and used Navy floats and seaplane parts; hand starter for Kinner, $25. Frank Mills, Essington, Pennsylvania.

PRATT & WHITNEY Wasp crankshafts (new), $10 each. Used cylinders, $10 each. Rising Sun Motors, H and Luzerne Streets, Philadelphia, Pennsylvania.

PROPELLER PRICES REDUCED: Steel props for J6, J-5. Brand new late production Hamiltons, any size, $15. Marshall, Bennett and Flottorp propellers for all motors. Central Air Service, Grand Rapids, Michigan.

FAIRCHILD FC2 right wing, tail assembly, four wing struts; right side landing gear; one 32x6 Bendix wheel. Seven Axelson B cylinders. Good condition. Dan Morgan, Nahma, Michigan.

WINGS: Used and rebuilt, for Waco 10, Waco cabin, Travel Air, American Eagle; many others. Wanted: wrecked or used wings. For sale: spars, ribs. New London Aircraft, New London, Ohio.

SZEKELY CYLINDERS: SR-3 45, made on order; forgings of steel; 14 fins; weight 8 pounds; approved Dept. Commerce. Guaranteed against breakage. Spencer-Turnbull Company, 278 Main Street, Hartford, Connecticut.

FOR SALE: OX Command-Aire parts; nearly all. Good condition; not cracked-up. Propeller. OX-5 motor slightly used. Joseph Marchner, 30 Ohio St., Rochester, New York.

FOR SALE: J-5 motor in very good condition; less than 500 hours. Steel prop, re-etched. All parts for Stinson SM1B. Will sell very reasonable. R. Snover, 2535 W. Grand Blvd., Apt. H5, Detroit, Michigan.

BARGAINS FOR CASH: Axelson model A motor, good condition. 50 hours since major overhaul. 7 extra cylinders, 1 Scintilla magneto, 1 Stromberg carburetor. Don Yee, Box 309, Las Vegas, Nevada.

PROPELLERS: OX-5 with A.T.C. No. 453, $23.50. Aeronca, $15; Szekely 45, $15. For quick service order from ad. List complete line, 10c. Bennett Propeller Co., Morganton, North Carolina.

WINGS: 1 right Robin wing, new with gas tank, no crating charge. 1 left lower Fledgling panel, like new. Will accept reasonable cash offer. Box 1118, Raleigh, North Carolina.

AIRWHEELS: Two used 16 x 7-3 Goodyear tires, tubes and hubs. Tires good shape; lots of patches on tubes, but serviceable; hubs probably need rebushing. $35, crated. W. B. Brice, Bowie, Texas.

CIRRUS ENGINE (Mark III) American, parts; Hamilton propeller, complete, rated 70 h.p. for sale. All parts good condition. Inquire Aero Trades, Roosevelt Field, Garden City, L. I., N. Y.

Wanted To Buy Or Trade

WANTED: Lower wing for Arrow Sport. Prefer uncovered. Write AERO DIGEST, Box 1741.

WILL TRADE 1929 Packard Eight DeLuxe Coupe in excellent condition for comparatively recent ship in licenseable condition. Car now located in Elizabeth, N. J. Give full details in first letter. J. R. Mendenhall, Fox Theatre, Boise, Idaho.

WANTED: DH Gipsy Moth complete or less engine; floats for same; also Gipsy engine needing overhaul. Cash for good buy. AERO DIGEST, Box 1742.

WANTED TO BUY: Waco F-2 or F with or without engine. Will buy a crack-up in either of these ships. John M. Armstrong, Tulsa Commercial Airport, Tulsa, Oklahoma.

WANTED: Airplane, in good condition. Reasonable. Must be willing to accept a piece of improved property as part payment. Balance cash. AERO DIGEST, Box 1750.

WANTED: OXX-6 or J-5 motor. OXX-6 Miller pistons. 30 x 5 wheels. Brake assembly, 1¾ hubs. OX Flottorp propeller. J6-5 Travel Air. Wilfred Blain, Grand Rapids, Michigan.

HAVE CASH for J6-9 major overhauled motor. Have like new Kinner K-5 for sale, $250. Western Airplane Distributors, 602 Graphic Arts Building, Kansas City, Missouri.

CLASSIFIED ADVERTISEMENTS

10c. PER WORD; $2.50 MINIMUM. PAYABLE IN ADVANCE.

Wanted To Buy Or Trade

TRADE: Have Short-Nosed American Eagle, Kinner, airwheels, licensed, few hours, good condition. Want cracked Waco F or plane needing repairs. Bob Curry, Seymour, Indiana.

WANTED: For cash, less J-6 330 h.p. motor, any good licensed 4- to 6-place cabin ship. Give full information and lowest price in first letter. Michigan Aero Motors, Jackson, Michigan.

HAVE CASH for good Waco 10, OXX-6 preferred, or other good ship. No junk, price right. Give full details. Honesdale Airport, Honesdale, Pa.

WANTED: Metal propeller for Warner motor; rate of climb indicator; wheel pants for 6.50-10 wheels. Alfred Janick, 13221 Moran Street, Detroit, Michigan.

WANTED: 50 h.p. Salmson motor in flying condition. Would consider Continental 40. Give full condition of motor in letter. Must have prop and all accessories. Frank Cobble, Gainesville, Texas.

WANTED for cash: 2-place Aeronca. Ship and motor must be excellent condition. Give complete details, photo and price, first letter. AERO DIGEST, Box 1751.

WANTED: Velie Monocoupe or Kinner Bird. No junk. Will pay cash. Write P. O. Box 305, Madison, Wisconsin.

WANTED: Great Lakes or Driggs or similar ship, less motor, that can be licensed with Cirrus motor. Cash. Fabric no object. Ken Morey, Adrian, Michigan.

WANTED: Ship less motor, designed for Curtiss Challenger 185 h.p. motor. State lowest cash price. G. S. Scott, 89 Revere Street, Waterbury, Conn.

WANTED TO BUY: Kinner or Warner Bird for cash. Must be first class. Write or wire complete description. James C. Rose, 612 N. Grove Avenue, Oak Park, Illinois.

WANTED: Aeronca 2-place Collegian or similar ship. Also interested in Buhl Bull Pup speedwing. Cash for best bargains. Write Earl Gustafson, Marinette, Wisconsin.

WANTED: 330 h.p. Bellanca. Have J-5 Pitcairn to turn in. Balance cash. Give full information, prices and details in first letter. Becker-Forner Flying Service, Inc., Jackson, Michigan.

WANTED: For cash, airplane, any condition that can be repaired, less motor. Give complete details and lowest price. Also C-2 Fleet fuselage. AERO DIGEST, Box 1756.

WANTED: Two or three-place licensed plane. Give guaranteed condition, photo. Prefer lightplane; anything considered. Must be cheap for cash. Maul & Coe, 1010 N. 3d St., Phoenix, Arizona.

WILL BUY Aeronca C-3, Velie Monocoupe or similar ship, delivered North Texas, if priced under $500, with terms. Reference furnished. AERO DIGEST, Box 1762.

WANTED: Flying boat, three or four seater. Must be licensed. Give full particulars. Frank Mills, Essington School of Aviation, Essington, Pennsylvania.

Miscellaneous Services Opportunities, Offers, etc.

CAPITAL WANTED to manufacture low-priced two-seater low-wing monoplane, approved by Dept. of Commerce; or will sell manufacturing rights. AERO DIGEST, Box 1754.

RADIO ENGINEERING: Broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Allen Street, Valparaiso, Indiana.

PROPOSITION ME: I have a Velie M-5 65 Monoprep, appraised value $640. A-1 condition. Partnership, lease or any money-making proposition anywhere. (Desire working connection. Experienced in merchandising and office work). Detail your reply. Pilot, 210 West 4th, Cincinnati, O.

CAPITAL WANTED to build airplane passenger safety device for demonstration purposes. Valuable, sound investment. Write AERO DIGEST, Box 1759.

CORPORATION HAS seaplane base, shop equipment, experienced organization, approved flying boat and design. Nucleus for production, school, airline, etc. Desire to contact company or individual requiring above facilities. Location Brooklyn. Have interesting production proposition. Also attractive storage rates. AERO DIGEST, Box 1760.

WANTED TO BUY, lease or partnership: six- or eight-place ship on floats, at contract work for season. AERO DIGEST, Box 1766.

Parachutes For Sale

PARACHUTES: Approved type. Seat, back, lap and chest; bought and sold; exchanged, repaired. Tell all first letter. Professional parachute jumpers and balloonists furnished for all occasions. Thompson Brothers Balloon and Parachute Co., Aurora, Illinois. Established 1903.

Positions Wanted

YOUNG MAN: American, 27, college, clean cut; single; private secretary, stenographer, typist, years of varied business experience; familiar blue prints, motors; inventive aptitude; successful background; immensely desirous getting into aviation. Can some executive or individual use the services of progressive young man, adaptable, congenial, precisely efficient; very nominal salary. Go anywhere, immediately. H. Crum, 2766 Marion Avenue, Bronx, New York.

MECHANIC: Both licenses. Graduate of North Dakota State School of Science. 22 years old, single, desires position. Go anywhere. A-1 references. Clarence Selbey, Velva, North Dakota.

TRANSPORT PILOT: A & E mechanic, college graduate, desires position combining piloting with executive and sales experience. Age 32. Eleven years' aeronautical experience. 1100 hours flying, all types. Captain Air Corps Reserve. AERO DIGEST, Box 1749.

TRANSPORT PILOT: 800 hours; experienced in cross country flying, instructing and general upkeep of your airplane; will go anywhere. Fremont C. Rohrer, Cochrane, Wisconsin.

TRANSPORT PILOT desires connection, school or private owner. Plenty of experience. Four years on aeroplanes, motors. Good references. Married; age 29. Go anywhere. AERO DIGEST, Box 1747.

ARMY PILOT: Aeronautical engineer. Five years Army flying. Maintenance and designing engineering. Available June 15. Age 26. Single. Excellent references. AERO DIGEST, Box 1748.

TRANSPORT PILOT: Age 29, single. Experienced instructor with 700 hours. AERO DIGEST, Box 1746.

YOUNG MAN with machine shop experience desires work as airplane mechanic's-helper or apprentice. Will work for room and board. L. H. Armistead, Somerset, Texas.

TRANSPORT PILOT: A and E Mechanic. Flying since 1923. Former state aeronautical inspector and university aviation instructor. Clean record. Age 30. Married. Reliable. Excellent references as to character, flying and executive ability. AERO DIGEST, Box 1744.

MANAGER-ENGINEER: Contract expiring in July with internationally known sport plane manufacturer. Desires financial backing and guarantees to show results. Willing to organize foreign manufacturing company if desired. Added information or interview upon request. AERO DIGEST, Box 1764.

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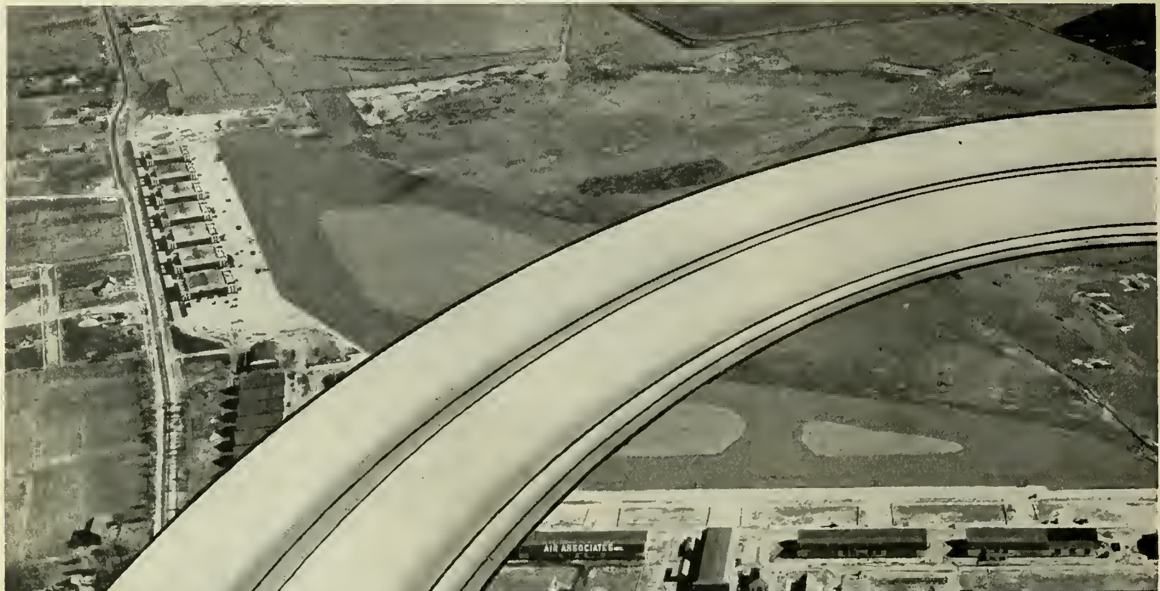

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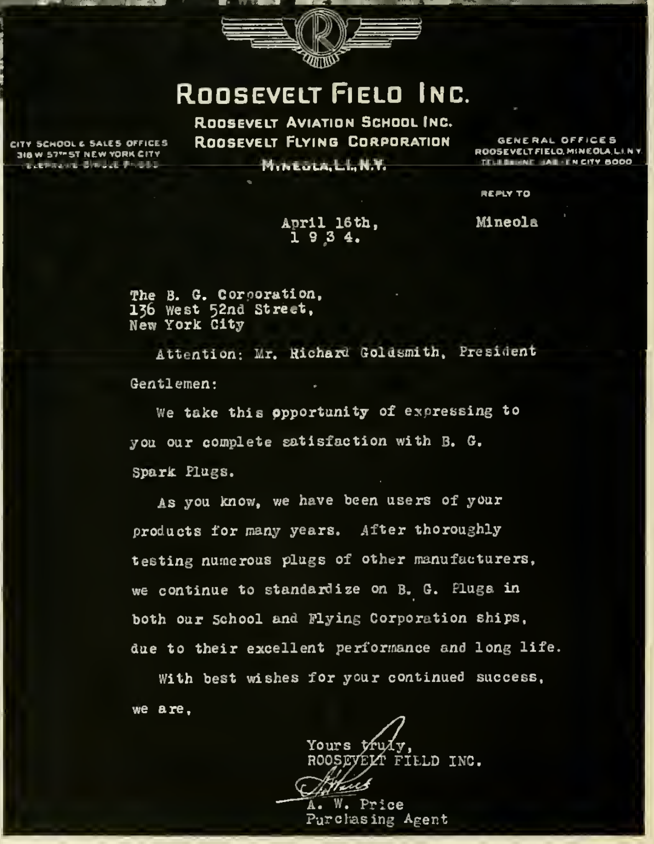

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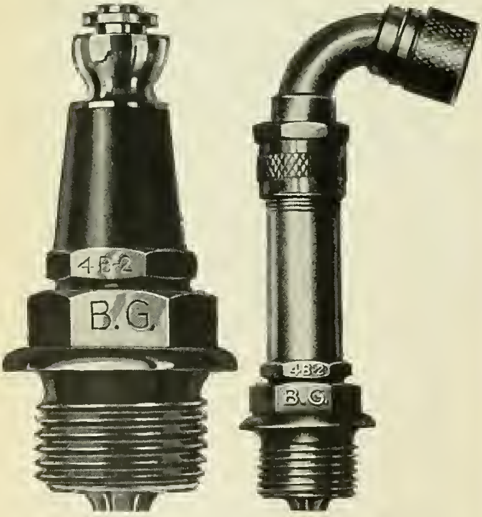

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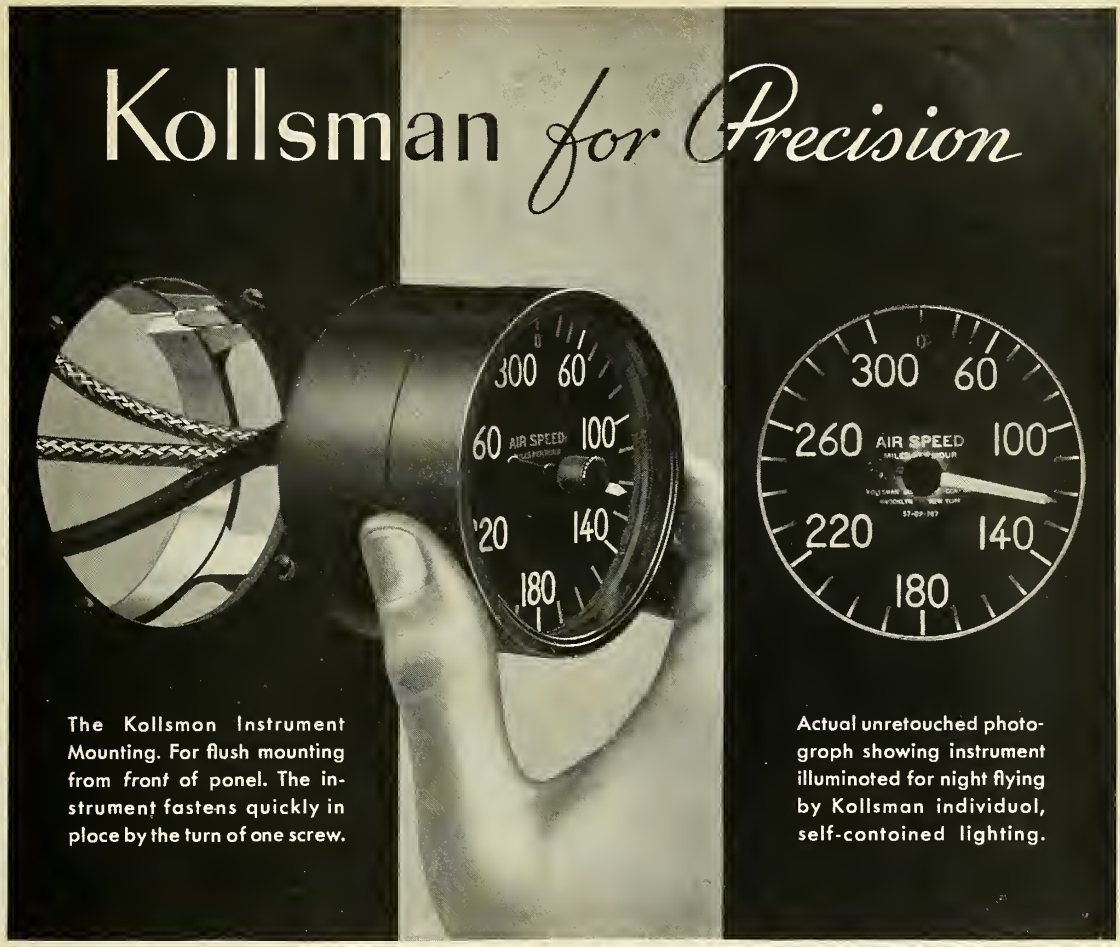

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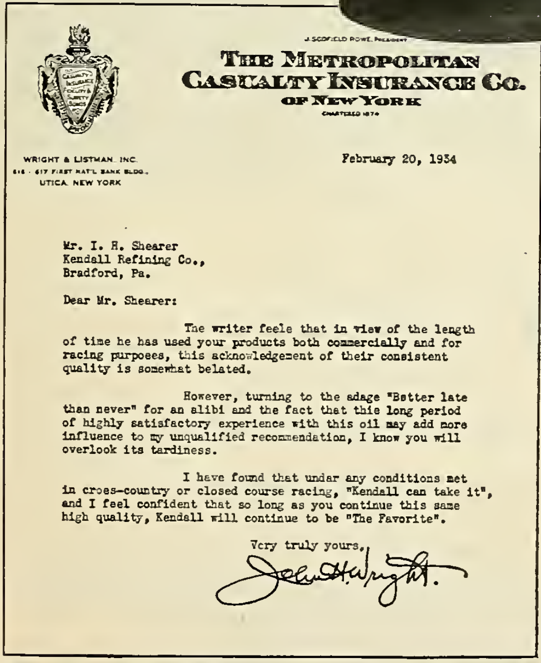

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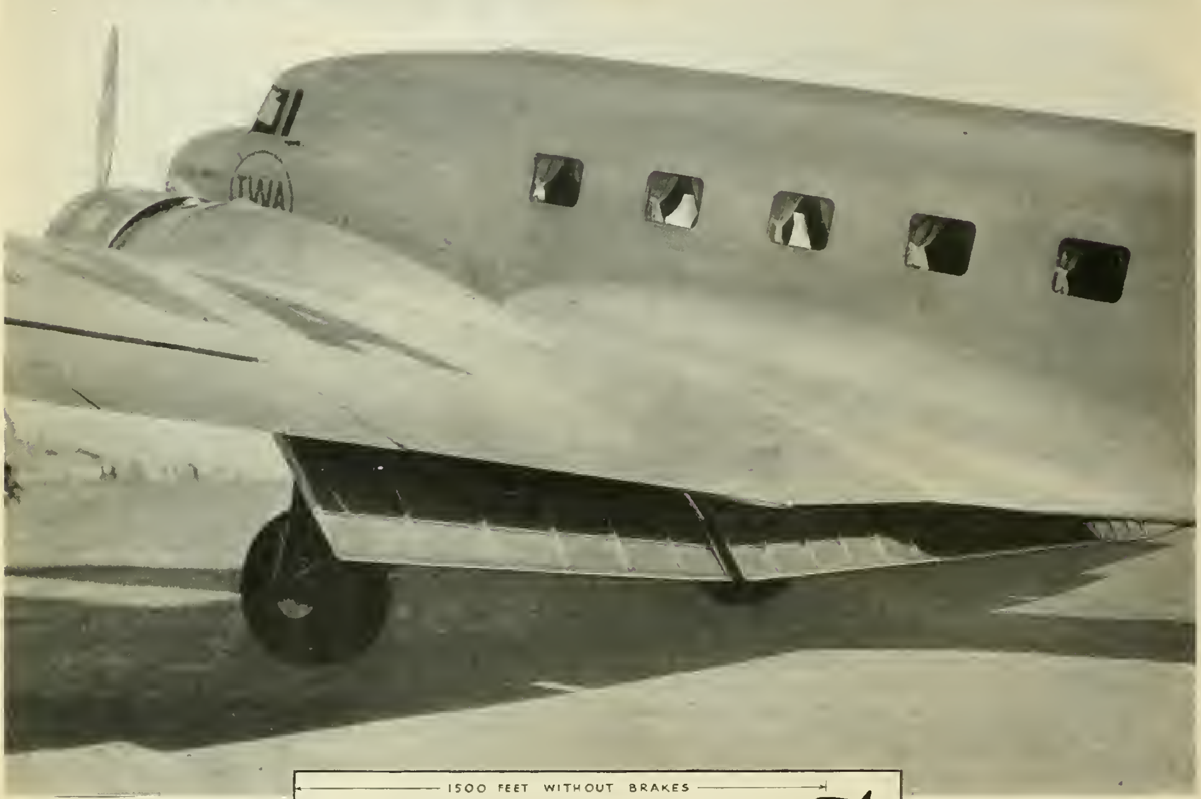

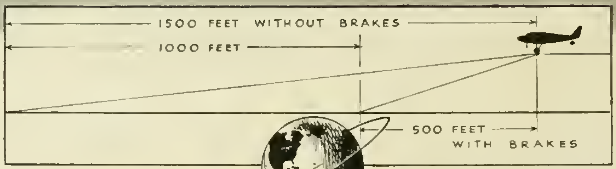

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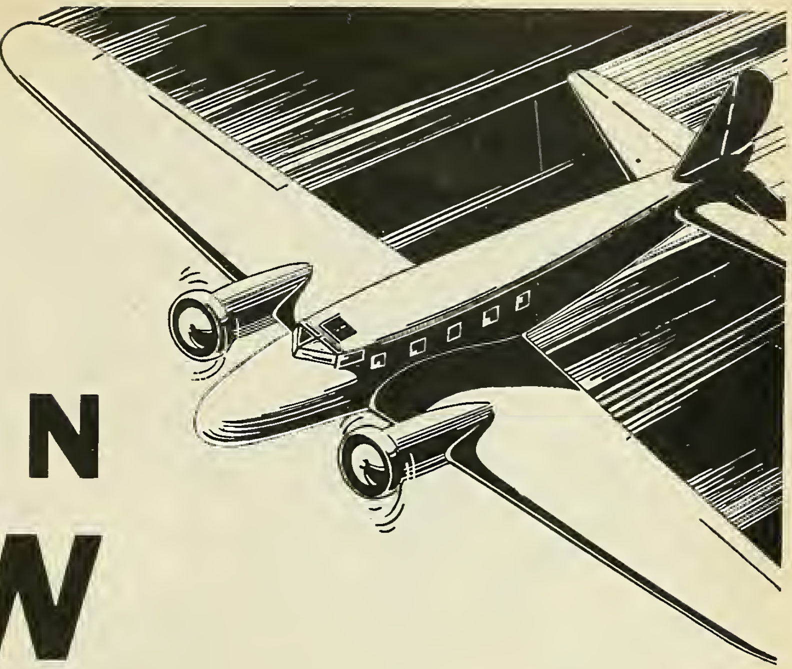

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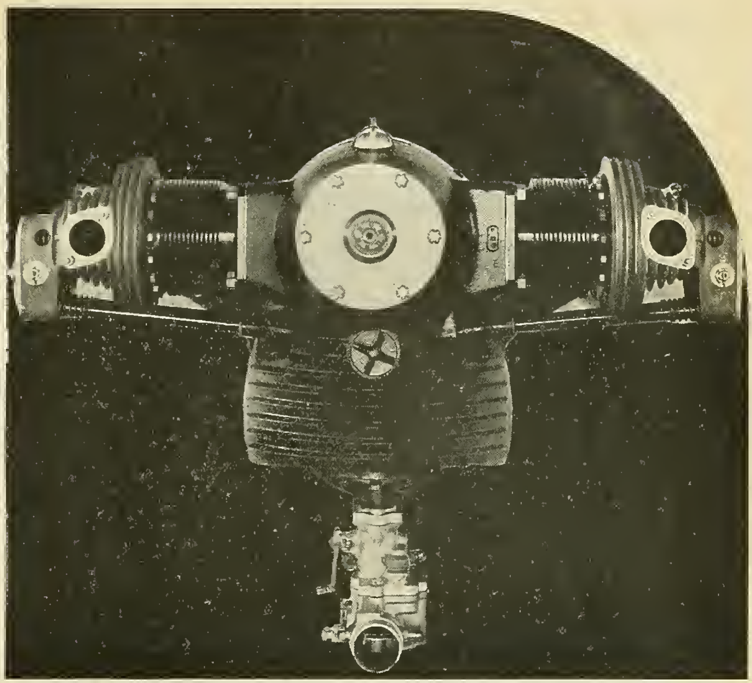

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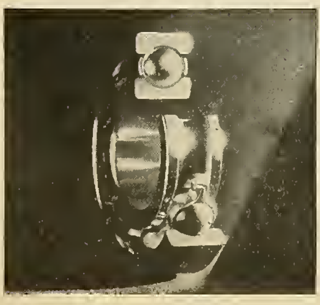

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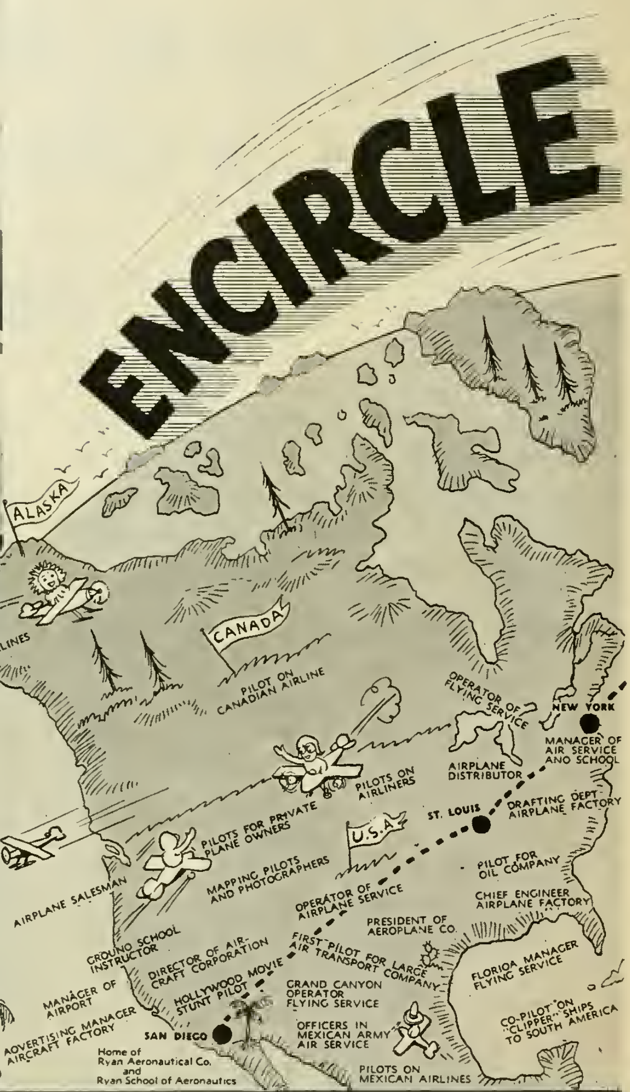

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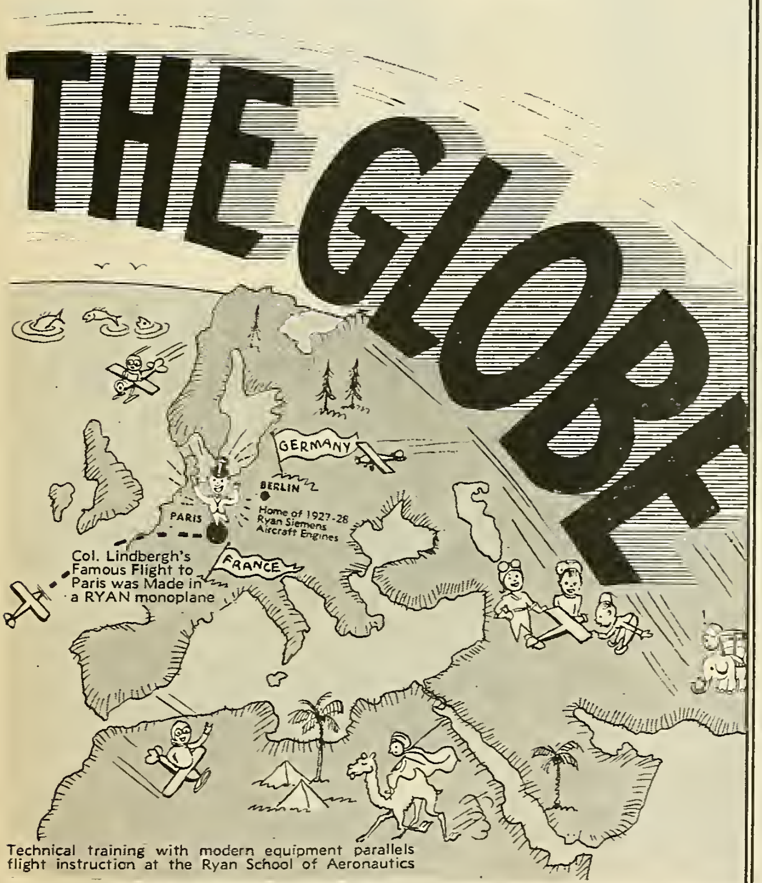
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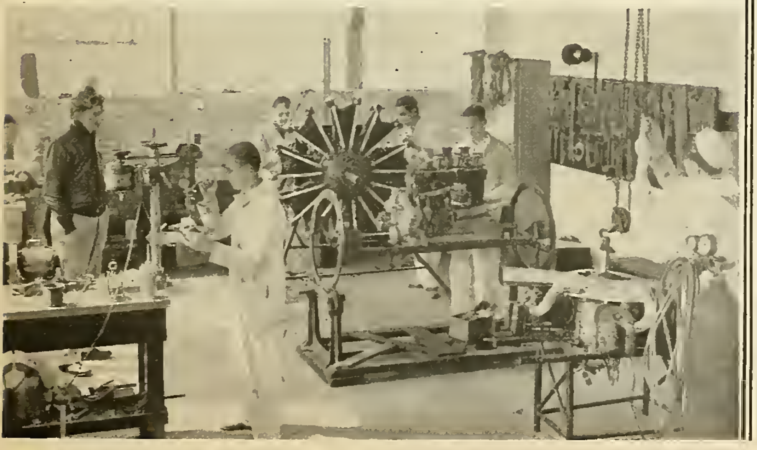

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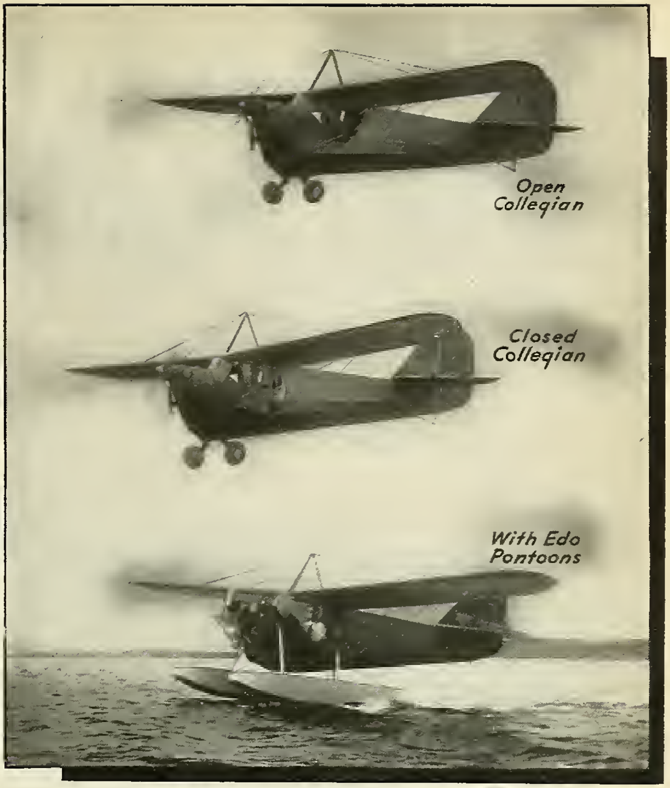

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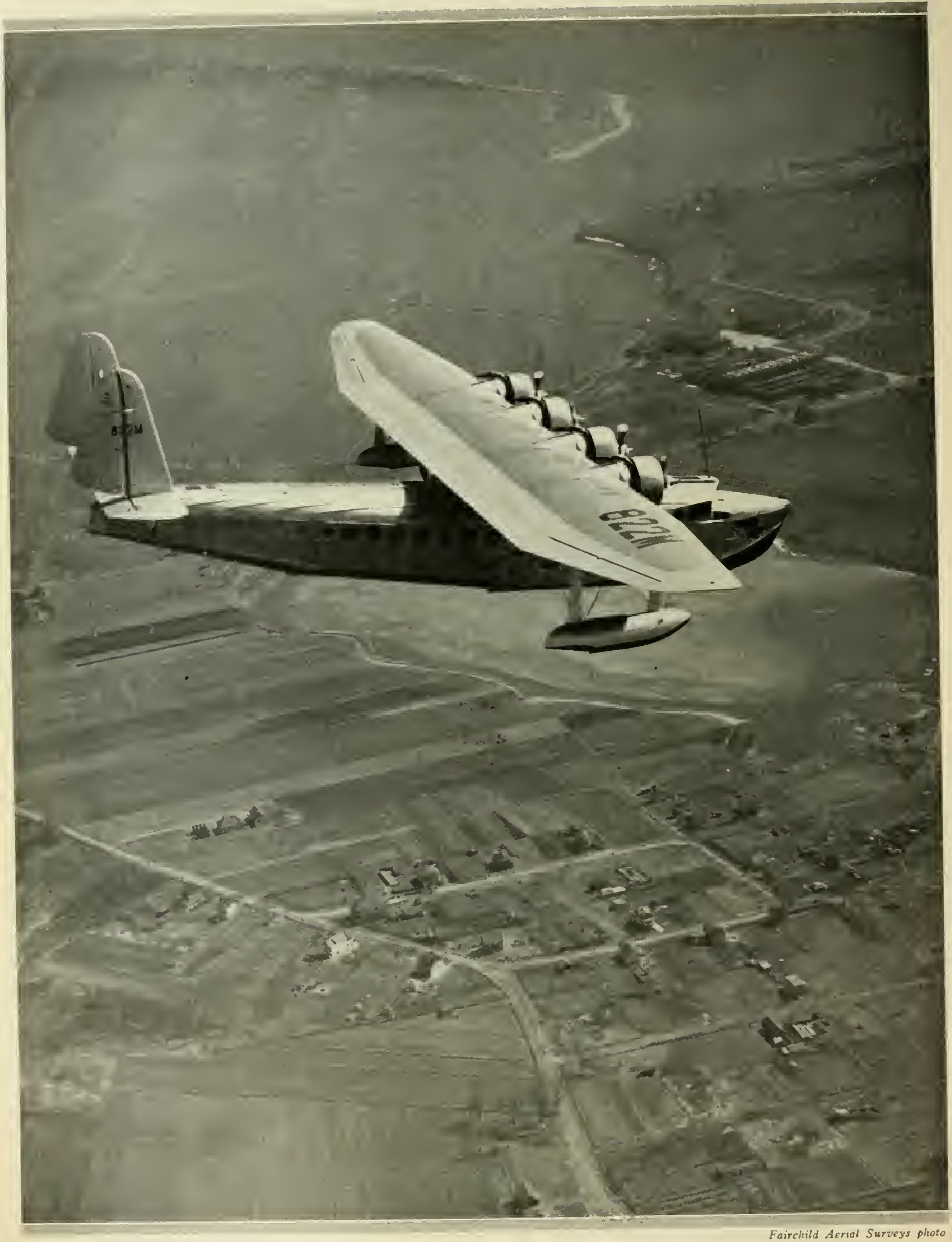


Fairchild Aerial Surveys photo

Test flight of the new P. & W.-powered Sikorsky S-42 flying boat for Pan American Airways

AIR

Hot and Otherwise

●

FRANK A. TICHENOR

● In Washington we have government by inquisition and government by destruction. No further proof of this is needed than the evidence supplied by the Administration's wrecking of the American air mail transport structure. A house was torn down in order to capture some alleged suspected rats that someone, very politically-minded, thought might be hiding in the garret. A lot of names were called, no rats were caught or even found.

For their pains the diligent and "idealistic" but luckless rat catchers have to their credit:

The taking of human life.

The destruction of the value of stocks purchased and owned by investors.

The crippling of business through the removal of one of its most important implements of speed communication.

The shrinking of the volume of air traffic industriously built up over a period of years.

Reformers' Achievement

It is in the midst of this wreckage, one of the most appalling ever achieved by blind and stupid political manipulation, that the master minds of the New Deal sit weeping today, crying for new worlds to destroy.

The single "achievement" of these diligent reformers is one which even the most stupid, selfish and grasping of their opponents would never have had the cheek to propose, namely, now that everything is destroyed, everything will be all right again if everyone just changes his name. That is the sole "constructive" thought which has been contributed by the wreckers.

The damage having been done and the further crying of havoc being almost as pointless as anything which the wreckers have done, the time has obviously come to begin to rebuild. But before sanction is given for such a move, it would perhaps be worthwhile to explore further into the wreck, to be sure we understand some of the hidden political and selfish motives which prompted the destruction in the first place.

Senator Warren R. Austin is among the first to propose a little further exploration into the foundation upon which the Farley gang now suggests, in considerable haste, that rebuilding begin. He states, and we believe conclusively, that the record contains proof that altruism was not the only motive for the Democratic administration's destruction of the private air mail carrying organization. He says:

"The record shows two effectives bombarding the Post Office Department for cancellation of the air mail contracts:

"1. The organized non-subsidized operators;

"2. Political spoilers.

"The record reveals a campaign so comprehensive that the self-seeking interested companies brought their influence to bear upon Committees of the Senate and House and individual Senators and Representatives (Tr. 7904), the Special Investigating Committee, and the Postmaster General, with ever-increasing urgency until the objective of cancellation was reached.

"The record discloses that the society (Tr. 7887, 7889) formed for the purpose of securing cancellations, kept an attorney of Washington busy with officials and committees, and that individual companies also employed him for the same purpose. He testified in the hearings that he was working to get an opportunity for his client to bid on air mail contracts. (Tr. 7879). The record shows that such an opportunity could not be had without cancellation. (Tr. 7884).

Just Between Friends

"The record shows that this attorney had been an official of the Post Office Department for 22 years, from 1903 to 1925. (Tr. 7894).

"The record further shows that a friend of that attorney of more than thirty years' standing, Mr. Stephen A. Cisler, was made General Superintendent of the Air Mail Service and the former Superintendent was removed to another service. The significance of this change was called to the attention of this attorney's client by a letter saying, among other things: 'From what I know of Mr. Cisler I believe that you will get a fair consideration.'

"Mr. Cisler had been a comrade of this attorney in the mail service. The attorney wrote: 'He has never been employed by any mail operator, but he was General Superintendent of the Air Mail from about 1923 to 1926. He is at present stationed at Fort Worth, Texas, as Assistant Superintendent, Railway Mail in charge of Air Mail.'

"The record shows that the set-up in the Post Office Department also included two other Texas men, Solicitor Crowley and Fourth Assistant Postmaster General Evans. These are prominent names in the roll of the Democratic National Convention of 1932.

"The record discloses that Solicitor Crowley and President (of the non-subsidized operators) Braniff were working together before the Senate Special Investigating Committee. (Tr. 2794).

"The record reveals that the non-mail operators were 'after something more important than a short line contract.'" (Tr. 7903).

Once all the facts have been brought out concerning the motives and reasons for the destruction, we should be prepared to build soundly and anew. The instrument for this is at hand in the now pending McCarran air mail bill. It seems to us to embody the means to a fair and honest approach to the job which must now be done. It is non-political. It embodies no favoritism. It should protect the public against exploitation. It would protect the rights and wages of pilots. What is equally important, and a fact very frequently overlooked in Washington these days, it would protect the companies and their investors from suffering another unjustified upsetting of the applicant at the whim of the first politician who might chance to come along. It provides a sane, practical foundation upon which to build an air transport structure.

Temporary Contracts

One of the most absurd proposals of the President's so-called aeronautical advisers was that air mail contracts be let on a month-to-month basis, or what was little better a temporary one-year mail contract basis as proposed by that titan of aeronautical thought, Senator Hugo Lafayette (Where are we?) Black.

The McCarran Bill provides the structure to build up air transport primarily as a recognized carrier as the railroads are recognized. This means, or should mean, that when aviation has again proven its metal, its value and its worth, as such a carrier it need not be limited merely to the transport of a special class of mail, but then would be entitled to participate as a carrier of all first class mail which it would be capable of handling.

Little Rollo

● Little Rollo was hard at work in the garden, tearing up a line of young tomato plants that his Uncle Snoofty had planted that morning. Uncle Snoofty who only infrequently indulged in any form of labor, and therefore was tired, was seated by the library window solacing himself with a highball and picturing the luscious tomatoes that would spring from the earth during the coming summer. He glanced out just in time to see Rollo yank out the last of the plants and toss them aside.

"Rollo! What are you doing!" exclaimed Uncle Snoofty, gulping down the last of the highball and leaping outdoors.

"I'm helping the New Deal," explained Rollo. "I'm plowing under these tomatoes, like Commissar Farley plowed under the Air Mail Lines. Don't you understand the New Deal, Uncle Snoofty? Anything you don't like, you plow under. I don't like spinach, for instance—have you planted any?"

"I have not!" roared Uncle Snoofty.

"Then you've saved me a lot of trouble," remarked the ingenious child. "Please don't be annoyed, Uncle Snoofty; you're of the older generation and you don't realize how times have changed. Haven't you heard that there is too much of everything in the country, and that we're really too rich, which is the reason that fifteen million of us are too poor?"

This was a puzzler to Uncle Snoofty, a simple soul who invariably read the comic section of the newspaper while little Rollo waded through Walter Lippmann.

"I don't know about that," said Uncle Snoofty. "But I do know that about them tomatoes—"

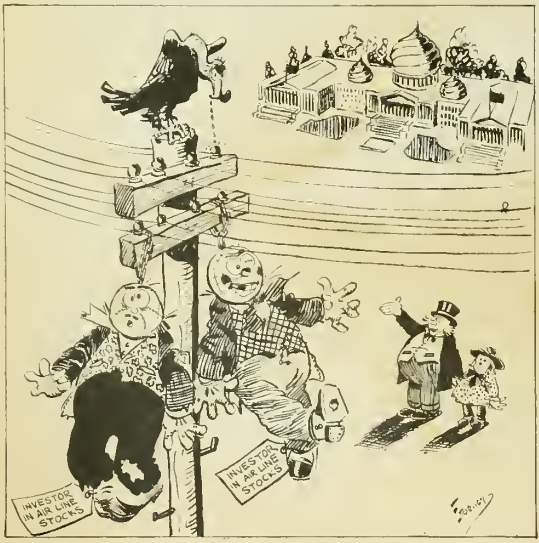
"*Those* tomatoes," Rollo corrected him. "What I was doing is called Centralized Control. You, in your ignorance, were adding to the Crop Surplus, and I, as a member of the Democratic Youth Shock Troops corrected you. The Secretary of Agriculture did the same thing to the farmers who were raising too many pigs—only it's harder to plow under a good lively pig than it is a tomato plant."

"Education is an awful thing," sadly remarked Uncle Snoofty, who had practically none himself. "Rollo, I fear the trouble is that down there in Washington we have too many highly educated and inexperienced men, like college professors. Now, if there's millions of people who can't afford pork, how are they helped by killing off a lot of little pigs before they grow up into pork?"

"You'll have to ask Secretary Wallace," said Rollo, neatly dodging the issue. "Anyhow, that's only one branch of the government. We have too much wheat and too much cotton, so we're plowing it under. But just to balance things, we're taxing the people to get money to buy cotton at a higher price to give to unemployed people who prefer silk anyhow. It's all a bit complicated."

"Rollo," said Uncle Snoofty, "I think that you and I should go to Washington and try to find out what these changes mean. I haven't been to Washington for ten years."

"You'll find it very different these days," said Rollo, having been there last winter with his father, who had been trying to get himself a job with the government, but not being a Harvard or Yale man, had no luck. "The only thing that hasn't changed much is the Smithsonian Institution. They've got a new stuffed gorilla, and a couple of Republican Congressmen, also stuffed, but it's the same old museum—like the Supreme Court."


INVESTOR IN AIR LINE STOCKS
INVESTOR IN AIR LINE STOCKS

"That's what they get for trying to make something out of aviation, without letting any Democrats in on the deal," Rollo replied.

"Rollo," said Uncle Snoofty, thoughtfully. "I don't want to be behind the times, even if I am getting a trifle old. Let's grub out the rest of this garden, so we won't have anything to eat this summer, and thus be in style."

"That's the idea!" cried Rollo enthusiastically. "Then we can go on the Relief, with all our neighbors."

So they plowed the whole garden under, killed Rollo's bantam hen and ate it, and then set off for Washington by train, as all the airlines had been put out of business in the interests of Recovery and a New Deal for Democratic aviation people.

The Old Order Makes Way for the New

"Well, there certainly are great changes here," remarked Uncle Snoofty as he and Rollo stood before the Union Station in Washington and looked up at a large Neon sign with the word WASHINGTONGRAD in red letters. There were other signs, such as "THIS WAY TO THE KREMLIN" and THAT WAY TO PENNSYLVANIASKY PROSPEKT. There were more signs indicating the way to Novgorod, Pskov, Cherepovetz, and Leningrad, indicating that the out-of-date American names of various suburbs had been changed to the more modern and pleasing Russian nomenclature. Uncle Snoofty was certainly startled when a taxi-driver called out to him, "Comrade, thirty cents to the Mayflowersky or New Willardovitch Hotels. Or a dime to the Salvation Red Army Hotelsky!"

"I suppose," remarked little Rollo, "that as members of the Proletariat we'd better walk. Doesn't do to look too Capitalistic by riding in a taxi. Well, well—I didn't know they'd hung those fellows!" He pointed across the square—renamed Ogpu Plaza—to several bodies suspended in chains. Under each carcass was a sign, "Investor in Airline Stock." Little Rollo smiled happily. "That's what they get for trying to make something out of aviation, without letting any Democrats in on the deal," he said. "You know, Uncle Snoofty, the only way to be entirely happy under the New Deal is to have nothing, do nothing, and live off the fellow who *has* something and has *done* something."

Thus chatting merrily, the pair wandered up Pennsylvaniasky Prospekt until they came before the New Willardovitch Hotel, and there they saw dear old Bill

Goes to Washington

●

CY CALDWELL

MacCracken, a prisoner trying his best to stay arrested. He and his reluctant jailer, the Sergeant of the Senate, were battling away in a window. The jailer was trying to escape, and the prisoner wouldn't let him.

"Now right there," said little Rollo, "You have the keynote to the New Deal. *Everything is reversed*. It used to be that prisoners tried to escape from their jailers, but now the jailers try to elude their prisoners.

"Just to illustrate—see that big building over there?"

"You mean the one with UNITED STATES TREASURY on it?" asked Uncle Snoofty.

"That's the one," said Rollo. "Only it's called THE KREMLIN now. It's no longer a treasury, because a treasury is a place where you keep a treasure. And we don't keep anything in there any more."

"We don't?" exclaimed Uncle Snoofty. "Why, I thought that was where all our taxes went."

"They do," said Rollo, "but they don't stay over-night." He pointed to a line of people, all Republicans, carrying bags of money into one side of the treasury, or Kremlin. On the other side of the building an even longer line of Democrats was walking off with the money the Republicans had just brought in. "That is going on constantly," said Rollo. "The Republicans bring it in, as Taxes, and the Democrats take it out, as Relief. Each night the Treasury has to be absolutely empty—that's a law. The only thing we keep there now is the National Debt, and hope."

"Who is the man trying to get out of that window with a big bag?" asked Uncle Snoofty.

"Dear me!" exclaimed Rollo. "Is he still at it? What persistence! Why, uncle, that is my dear friend Eugene Vidal, in charge of what aviation remains. For months he has been trying to snatch that bag and someone keeps on pulling it back in again. That is the $500,000 he thought he could get to develop a $700 airplane with. Those two chaps on the outside pulling on his coat-tails are a couple of manufacturers who hope to get some of what is in the bag."

"By the way," remarked Uncle Snoofty, "I understand that a good airplane can be built for $700 but that it will be a trifle small. The difficulty will be to get a pilot small enough to fit inside it."

"No difficulty there," responded Rollo. "The dwarf who sat on J. P. Morgan's lap will be the pilot. This $700 airplane is for dwarfs. Under the New Deal a dwarf is going to amount to something in aviation. A dwarf will carry the Air Mail—for by the time the Administration gets its Air Mail policy finally decided, there won't be more than enough mail for one dwarf to carry; it's shrinking daily."

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Vacations—Fish—Taxpayers

At this moment, with a blare of trumpets and a great thumping of drums, a procession hove into sight.

"I declare!" exclaimed Rollo. "We're in luck. Here's the President returning from another vacation. Do you remember dear old Hoover?—he was always going off fishing, too. What is there about a poor fish that is so interesting to an American President? Does it remind him of a taxpayer?"

Before Uncle Snoofty could reply the procession was upon them, with the Chief Executive smiling and bowing right and left and talking into a microphone. The speech sounded fine and people were cheering lustily.

"He's a great actor," said Uncle Snoofty. "I just wish he had a better supporting cast. There are some awful hams in his troupe—I'm thinking of Commissar Farley."

"You musn't blame the President for that," said Rollo. "He's a good egg, personally, but he had to give jobs to the people who put him where he is. That's not his fault—it's just a handicap of a Democratic form of government."

A crashed fuselage drawn by a dozen discouraged Army mechanics went past, with a General sitting on it, explaining, apologetically, the difference between military and air mail flying.

"Dear old Benny Foulois!" exclaimed Uncle Snoofty, who in his youth had been an Army pilot. "You know, Rollo, I think Benny had a poor deal out of this mess. General Douglas MacArthur made the decision that the Army could fly the Air Mail—and could Benny say no? Of course not. And what does Doug MacArthur know about aviation?"

"But MacArthur has side-stepped," replied Rollo. "That leaves General Foulois holding the well-known bag."

"It's a darn shame," said Uncle Snoofty. "And it all rests on Commissar Farley. You can't transform a ward-heeling politician into a Postmaster General. There's no use holding a man up as a Great Leader if he can't pick capable and honest subordinates to carry out the details."

"Don't get so heated, Uncle Snoofty," said Rollo, "it's bad for your circulation."

"Well, that can't be helped," growled Uncle Snoofty. "But here's old Benny Foulois who has been carrying on for years with insufficient appropriations to keep the Air Corps up to date either in training or in equipment. And then they shove an impossible assignment down the Army's throat and blame the Army pilots if they can't carry it out. It's unfair, that's all. And there are the bodies of a dozen young Army pilots lying in graves to prove it."

"You're getting over-heated, Uncle

(*Continued on page* 43)

But with a toot on a trumpet, the egg-rolling contest started off with a loud hurrah!

EDITORIALS

"France has 4,500 planes; Belgium, 300; Poland, 1,000, and Czechoslovakia, 700. And, under the decrees which still hold its national defense in shackles, Germany, to oppose these 6,500 machines, has not even one single plane. Germany's new government, and I, as Minister of Aviation, demand for German aviation the right to equip a limited number of planes for defense only."—GEN. HERMANN GOERING, German Minister of Aviation.

Our Exports Are Increasing

● One of the few pleasant incidents of recent months, and a ray of hope in our otherwise harassed industry, has been the healthy increase in our export business. Despite implications that American aircraft products are inferior to those of other countries, brisk trade with foreign nations has been consummated recently. Perhaps this will serve as proof that we are not so far behind in aeronautical development as the country may have been led to believe.

Since the first of the year (and especially during January and February when more than $2,000,000 worth of American aeronautical equipment found favorable reception in foreign countries for commercial, military and private flying) exports of our products have been on the rise. It is heartening to learn that February's business alone exceeded the million dollar mark and that indications point to an increasing demand for our products all over the world.

From their past creditable and meritorious performances, it will not be long ere American planes, engines and equipment will be used in more foreign countries despite insinuations belittling their worth before the people of the country in which they are so successfully produced.

The foreign market is the real test of merit, for in making sales in this highly-competitive field no patriotic motive prejudices the buyer in favor of American goods. He buys where he gets the most value for his money. If we continue to demonstrate the efficiency of our products in foreign fields as we have recently, we can reasonably expect a continuous and profitable steady increase in our exports.

Noteworthy Achievements

● The entire aeronautical industry joins in bestowing well-merited praise on Laura Ingalls for her remarkable solo flight of 16,000 miles starting at New York City, circling South America, and returning to New York, all in less than two months. Aside from demonstrating the efficiency and stamina of American aircraft and engines, the flight adds another record to the growing list of accomplishments of our women fliers.

When she landed her Lockheed Air Express at Floyd Bennett Field, New York, on April 25th, Miss Ingalls had achieved for herself and her country the honor of being the first to fly solo in a landplane along the route, first to fly solo around South America and first American woman to fly solo across the Andes Mountains—each an accomplishment worthy of recognition, and collectively a feat which has few parallels in the annals of aeronautics.

While that flight was in progress in the Southern hemisphere, other spectacular aerial accomplishments were being enacted by Soviet airmen in the barren wastes of the far North—a group of 102 Russians, stranded for two months on ice floes in the Bering Sea, were brought back by aircraft. Not only was this rescue a most humane enterprise, but also a most practical demonstration of intelligently employing airplanes in unusual emergencies.

The successful outcome of daring aerial expeditions such as these must excite the world's admiration and respect.

Reassurance Is Needed Now

● The difficulties of the Army Air Corps in flying the mail and the resulting adverse publicity attending the efforts of military pilots to get the mail through with efficiency equal to that of the civil airlines, left the American people wondering just how good their air force really is. The public remembers the difficulties experienced by Army airmen when the mail-carrying assignment was foisted on them in February. Some assurance must be given the public that our Army Air force will be capable of adequately protecting them in time of war.

America should be first in the air regardless of what means are used to accomplish this, or under whose direction it is achieved. Supremacy cannot come merely as a result of hope and a will to reach ultimate aerial strength. It can only come through definite, concentrated action on the part of those who are responsible for guarding the people of the United States.

The question of whether the air arm should be a part of the Army and Navy, or whether there should be a separate department of aviation is subordinate to the nation's needs. The answer is that regardless of the position aviation assumes in the national defense scheme, the protection of the country is paramount. Countries with less territory than we have, with fewer inhabitants relying upon them for protection and with smaller treasuries to draw upon, have managed to develop air forces to which they can proudly point as their protection from aerial attack. The United States, however, with more than 120,000,000 people, thousands of miles of coast line and with widely scattered territorial possessions, finds itself in an inferior position in comparison with the aerial forces of practically every other world power.

Inadequate equipment and an undermanned air force have helped place us in this uncomfortable position. But, if these were our only deficiencies, they probably could be rectified in short time. Unfortunately, however, the problem is aggravated by deep-rooted service jealousies and maneuvers of political cliques. Petty jealousies in the Army and Navy and political motives should have no place in a plan as far reaching and as beneficial as national defense.

The entire scheme of things must be changed and changed quickly. Adequate equipment and increased personnel, together with the provision for more flying hours for regular and reserve air officers and greater latitude in experimental and development work should be forthcoming.

Concentration of Facilities

● There has been considerable talk about transferring the work of the Manufacturers' Aircraft Association to the Aeronautical Chamber of Commerce. This seems to be a good time to bring about such a merger which would save the trade many thousands of dollars. In the interest of efficiency the proposed change should be put into effect at once.

The MAA does only patent work. The National Automobile Chamber of Commerce and other national chambers have divisions which deal with patent work and there is no reason why our industry should not have a similar arrangement. The MAA membership list shows only manufacturers of airplanes; this leaves manufacturers of accessories and all other Chamber members with no service on patent subjects.

Australian Race Attracts Prominent Fliers

● With the approach of June 1, closing date for entries in the London-Melbourne International Air Race, interest in the event and in the pilots and planes either entered or planning to enter begins to increase. In a race such as this, with its cash prizes of £15,000 and resulting fame for the winner, no effort is being spared in preparing planes which will creditably show themselves once the field gets under way from England on October 20th.

To the pilots in the United States the race presents the dual possibility of establishing the superiority of American aircraft and increasing the chances of a larger export business of American craft, in addition to the reward for placing, either in the speed event or handicap race.

To date very little information has been gathered concerning the entrants from the United States or Europe. As far as the United States is concerned, rumors have been rampant that Wiley Post, Roscoe Turner and the four Jimmies—Doolittle, Mattern, Wedell and Haizlip, intend to be on the starting line when the starter sends the planes off on the first leg of the long-distance event. Ships such as the Bellanca, Douglas, Gee Bee, Lockheed and Northrop have also been mentioned in connection with the race.

Some Entrants in Race

However, with the cooperation of E. J. Hart, manager of the London-Melbourne International Air Race Press Service, some insight as to the competition our pilots will encounter, if they enter, is available.

At the time of this report, only one entry each in the speed and handicap section has been received. In the former, one of the new mystery deHavilland Comets for which the manufacturer guarantees a top speed of at least 200 miles an hour, has been entered by A. O. Edwards, managing director of the Grosvenor House Hotel, London. C. W. A. Scott will fly the plane as chief pilot, while Thomas Campbell-Black will accompany him as assistant pilot.

An Airspeed Courier, a six passenger monoplane powered by an Armstrong-Siddeley Cheetah engine of 260 horsepower and capable of a top speed of 172 miles an hour and a cruising speed of 150 miles an hour, has been entered in the handicap event by Aircraft Exchange and Mart, Ltd., distributors for Airspeed, Ltd., Allen L. T. Nash and S. Lewis Turner, both directors of the former, will fly the ship as chief pilot and assistant pilot respectively. Further information concerning the Courier tells of a retractable landing gear.

One of the Mew Gulls for the race

While these are the only entrants thus far, definite orders have been placed by a number of other possible entrants for planes to be built especially for the race.

Bernard Rubin, well-known Australian amateur racing motorist has ordered one of the long-range Comets and is making a detailed survey of the route, spending some time at Baghdad, Allahabad and Singapore, control points where arrangements will be made for fuel and oil.

While Sir Charles Kingsford-Smith placed a conditional order for a Comet, it is understood he is coming to the United States to take delivery on a high-speed Lockheed Altair before continuing on to England. Capt. Patrick Gordon Taylor will fly with him as assistant pilot.

Another purchaser of a Comet is the famous team of James A. and Amy Mollinson. The news of their expected entry has been welcomed in British aviation circles as it brings them together in actual competition with their old rivals Kingsford-Smith and C. W. A. Scott.

Another well-known name added to the list of entrants is Col. J. C. Fitzmaurice, who made the east-west trans-Atlantic crossing some years ago in a Junkers plane, and who is being sponsored by Joseph McGrath, managing director of the Irish Hospital's Trust, Dublin. McGrath is allowing Fitzmaurice the opportunity of picking any plane he desires and of making all arrangements incident to preparations for the race. Fitzmaurice probably will fly a Lockheed Orion.

Entries from Other Countries

Other probable entries are expected from Holland where the Dutch Ministry of Defence has purchased a Postjager 24 to be flown in the speed race by Dutch Army pilots. The ship, purchased in conjunction with the Royal Netherlands Automobile Club, is a tri-motored monoplane powered by Wright Whirlwind engines of 420 horsepower each and is equipped with a retractable landing gear. In addition, Holland may be represented by the Fokker XX or Fokker XXII in the speed race and by the Fokker XXXVI in the handicap race. All are multi-motored transports powered by either Wright or Pratt & Whitney engines.

The Indian Chamber of Commerce in London recently started an Air Race Fund and personal appeals are being made to provide a native pilot with the equipment to enable him to compete. The team most prominently mentioned consists of Aspi Engineer (who won the Aga Khan trophy for being the first Indian to fly from Karachi to London and return) and Phiroze P. Nazir.

A special racer with two Armstrong Siddeley AS/8's is being built for Capt. T. Neville Stack by Airspeed, Ltd. Capt. Stack intends to enter the speed event.

Capt. Edgar W. Percival has constructed the Percival Mew Gull, but is as yet undecided whether to fly it himself or nominate another pilot. The Mew Gull is considered the fastest British plane of its size and power. It is powered by a Napier Javelin engine of about 165 horsepower and is expected to cruise about 175 miles an hour, with a top speed which is close to, or exceeds, 200 miles an hour. The first plane of its type carries sufficient fuel for a flight of a little more than three hours.

Bibesco Cup Winner Possibility

For Italy, Capt. Osvaldo Baldi, winner of the 1933 Bibesco Cup, may enter a special Caproni monoplane capable of cruising at 200 miles an hour. If this is the same plane in which Capt. Baldi and his assistant, Lieut. Buffa, won the Bibesco Cup, it is powered by a 650 horsepower Fiat A.30 and is capable of sustaining high speeds, as evidenced by its 221 mile-an-hour-average between Rome and Bucharest.

A well-known French stunt pilot is reported to have purchased a Lockheed while an R.A.F. officer is said to have been invited by Douglas Aircraft Corp., to fly one of their planes. Confirmation of these two reports, however, is lacking.

Women will also probably have a place in the race. Laura Ingalls has been considering the possibility of going over and the names of the Englishwomen Pauline Gower, Dorothy Spicer, Paddie Naismith and Marsinah Nieson are mentioned in conjunction with the speed or handicap event.

The above represent the field as it exists at about the middle of April, but more entries are expected this month particularly in view of the Royal Aero Club's decision to allow all types of American aircraft to compete in the race.

Thunderstorms and Line Squalls

●

PHILIP DEL VECCHIO

● There is no other meteorological phenomenon, excepting perhaps the tornado, which incorporates so many fundamental causes and effects as the thunderstorm, often a peril, and mostly a nuisance, to scheduled aerial operations. The complicated structure of this type of storm offers unlimited possibilities for a practical and valuable study of its formation and prediction—not only to the airman and meteorologist but also to the aeronautical engineer.

The essential formation and the typical structure of a thunderstorm may be passed over briefly, since these are adequately explained in text books. The principal cause of the thunderstorm and the line squall is strong convective action—the forced ascent of air to heights at which its moisture is condensed to clouds and rainfall. The cumulo-nimbus (commonly called the thunderhead) is simply an overgrown cumulus, those brilliant white billows of cloud which appear frequently in the spring and summer sky.

Origin of Thunderstorms

Although the thunderstorm may form almost anywhere and at any time of the year under the right conditions, probably 80% of the storms of this type occurring in the United States, have their origin in the southeast quadrants of low pressure areas in mid-summer. The air in these quadrants is abnormally heated, especially near the surface and the lowest air layers, a condition which causes great instability of the air columns. Aerographs made by kites and airplanes have shown that under these conditions a vertical temperature gradient which approximates, or exceeds, the adiabatic rate of dry air exists up to the level of cloud formation, and from that point upward is that of saturated air. It is at these times that condensation and cloud formation is carried on to great heights, resulting eventually in the formation of cumulo-nimbus.

The instability of the air mass in this sector of the low may be due to a number of causes, nearly all of which are controversial. Abnormal heating of the lower air layers and of the ground probably accounts for the majority of cases of cumulo-nimbus formation, but since there are times when this is not true there must be other explanations. One proved fact is that the colder air north and west of the low area may over-run the warmer mass in the southeast since it usually has much greater velocity, especially in the higher levels.

Turreted cumulus about to become cumulo-nimbus, positive indication of a coming thunderstorm

On the other hand what may be called instability thunderstorms may develop in the spring and autumn over the eastern United States after a high pressure area has passed and has left behind it a thin surface layer of cool air. If a warm tropical current should then begin to over-run this cool layer at an altitude of five or six thousand feet, as often happens, convective showers will develop. It is here that the study of the upper air will aid in the prediction of such storms, because surface observations alone will not indicate strong convective action.

Secondary Low-pressure Area

Another fruitful source of severe storms is the secondary low-pressure area, sometimes typical, as shown in figure 1, but more often mere kinks or bends in the isobars of the parent low. Judging from the heavy rains which fall and the size and intensity of the thunderstorms developed there, the convective action near the center of these secondaries must be enormous. Here, also, the initial instability of the air mass may be given its original convective impetus by the comparatively fresh and cool northerly winds on the western slope of the secondary. These winds seem to have some of the properties of the cold squall line winds, even though they are followed after the passage of the secondary, by warm and muggy southwest winds.

Thunderstorms sometime form quite suddenly with scarcely any indication of their formation. Especially is this true if the cyclone is almost circular and the winds steady in its southern and eastern halves. The condition that then obtains is that of unstable air, unable, by itself, to start the convective action necessary to condensation. It awaits the push of the cool northerly winds of what eventually becomes the squall line. Sometimes the squall line (shown typically in figure 2) does not appear on the synoptic map until the storm area reaches the eastern part of the United States, and for a very simple reason. The importation of air into the southeast quadrant of the low is usually from the continental southwest while the cyclone is stationed in the western states, and therefore comparatively dry. Only when the pressure system reaches the position that will facilitate the importation of moist air from the Gulf and the South Atlantic does the air mass become so unstable that the squall line can make its appearance.

Thunderstorm formation is sometimes restrained until the hottest part of the day by that much-quoted (and much less understood) meteorological element, temperture inversion, a condition when temperature rises with altitude instead of falling as it normally should. Some airmen use their knowledge of these conditions to escape the formation of ice on wings, and since these inversions are almost invariably situated at the top of a cloud stratum, this level is an ideal place through which to fly.

Predicting Cloudy Weather

It is not commonly known that whether a day is to be cloudy or not is determined usually by the height from the ground of the lowest inverted gradient. For example, if the temperature is 80° F. and the dew point 70, the condensation point or the height of cloud formation will be about 2400 feet. Now, if a temperature inversion exists at 1500 feet the ascending air will not be able to rise past this point and will flow along the bottom of the inversion horizontally, literally spreading itself all over the landscape. If the inversion is small and holds all day there will be no convection clouds because the air which has ascended to the level of the inversion has not reached its dew point. If, however, the air at the surface becomes heated enough during the day to overcome the negative gradient, the sky will suddenly fill with clouds, and in extreme cases precipitation will fall within a few hours.

A positive indication that severe storms will develop may be observed in the white "puff balls" called alto-cumulus or high cumulus. If these clouds lie flat there is no danger of thunderstorms; but should they rise, towering, into the upper air and become alto-cumulus-castellatus (turreted alto-cumulus) it is a sure sign of thunderstorms in the making. They are formed by convective action, but instead of originating at the ground, the convection current starts at some level above it; for example, above an inversion layer. The gist of the entire matter is that when these clouds form they indicate the existence of a steep gradient to great heights and thus the probable formation of thunderheads to those levels. Any form of cumulus indicates convection currents at the altitudes where they form. Even cirro-cumulus, the smallest of the cumulus family, are the products of horizontally formed clouds condensed by the rise of obliquely ascending currents modified by weak convection from lower layers.

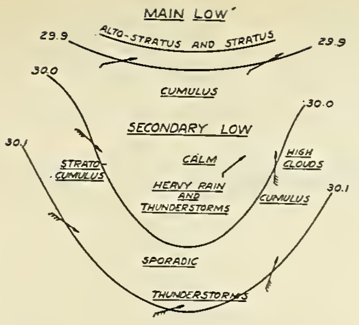


Figure 1. Secondary low-pressure area, fruitful source of severe storms

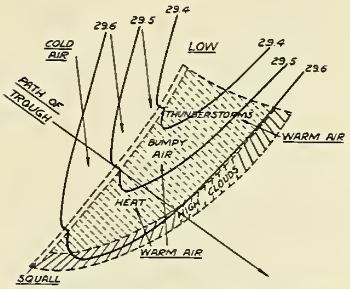


Figure 2. Line squall and conditions obtaining during its formation

Cold over-running northerly winds must be watched for carefully in the upper air reports, for these indicate unstable air, and are the potential causes of general overturning and widespread storminess. They may originate from the northwest in the rear of a cyclone, or, as in the case of Atlantic coast storms such as brought disaster to the *Akron*, may be pulled down from the North Atlantic. In the latter case, however, this type of thunderstorm seems to have been linked with another type which was caused by the meeting of the warm, muggy southeast winds flowing around the eastern side of the low-pressure area then central in the Middle Atlantic states and the cool dry air from the west and northwest. At this line of what we may call discontinuity, the thunderstorms developed and moved steadily up the coast until the northwest winds finally swept the air clean the next morning.

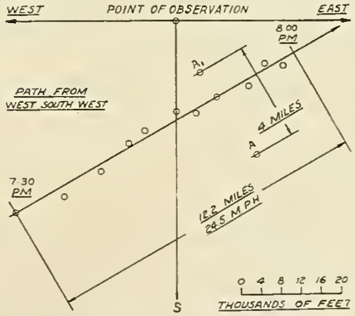


Figure 3. Chart of the speed and path of a thunderstorm, plotted by the author

One important thing which should be kept in mind while forecasting thunderstorms of the heat or cyclonic variety is that they will seldom develop over territory in which there has been precipitation of one sort or another the preceding day. Even an area which has been only spotted with precipitation is relatively immune, seemingly because insolation is powerless to cause the abnormal heating necessary until the ground has become dry and cooling by evaporation has stopped.

Charting Thunderstorm Paths

The author has used a method of his own to chart the path and speed of thunderstorms under observation, and which, though simple, yields very accurate results and can often be used advantageously by the flier. The only instruments needed are a protractor fixed with a sighting arm—on the style of the surveyor's alidade—a watch with a second hand, a pad and a pencil.

Briefly, the method is this: As soon as thunder can be heard, the bearing of the lightning is taken and laid out on paper starting from an observation point. If the lightning is widespread the average direction is used. Then the time interval between the lightning flash and the thunder is checked and multiplied by 1100 feet per second. This distance is then laid out along the directional line already plotted. A few minutes later the same process is repeated until a definite course has been established for the storm. Usually, the course and speed of a storm can be found within ten minutes and the observer knows definitely how far away from his station it will pass and how soon the maximum intensity will be experienced. One such storm is shown in figure 3 and was plotted by the author. It is significant that the Newark upper airs a few hours later showed a velocity of 26 miles from the WSW at 4000 feet, the calculated height of the thunderstorm base.

Pilots knowing such kinks as these would find them extremely useful in emergencies.

AVIATION ENGINEERING

TECHNICAL EDITORS: GLENN D. ANGLE • PROF. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

Notes on the Design of Continuous Beams

R. R. WIESE

●

● In steel building construction all joints are carefully braced with gussets and knee braces to give the members the effect of being continuous and this practice also applies specifically to airplane design where the weight strength ratio must be kept low. Many of our present-day airplanes have wing beams designed so that they will be continuous and military biplanes, both fighter and observation, frequently have continuous upper wings tapered in form, with the wing beams continuous and tapered.

Considered from a theoretical viewpoint it would seem best and more economical to make these beams continuous, because the fixity tends to reduce the bending moments and deflections in the mid-bays. However, when considering the design of a wing beam from this viewpoint alone, other facts just as vital may be overlooked—facts that indicate a loss of the beneficial effects of continuity.

The theoretical advantages attributed to the continuous wing beam are indicated in figures 1 and 2, which, while highly simplified, serve to show the essential characteristics. Disregarding the effect of axial load, it is seen that the maximum value of bending moment is only about 2/3 that for the pin-ended beam in the one case, and is about equal to that for the beam with one end fixed and the other pinned. This latter condition most nearly approaches the conventional pinned beam construction. Comparing mid-span bending moments, the maximum value for the fixed beam is only 1/3 that of the pinned beam, and approximately ½ that of the beam with one end fixed. Obviously, mid-span bending moments are important since they are a measure of the beam deflection and, where axial compressive loads exist, are a measure of the secondary bending moments.

From this consideration the conclusion is quite often drawn that large advantages accrue to the fix-ended beam. This would be true if in actual practice the points of support for the beam remain at the same level, but actually, the point of beam support represented by the outer interplane strut and flying wire deflect through a wide range when under load. For example, a pinned beam under a static test simulating high incidence may easily deflect 3 or more inches at the outer strut point, and while a continuous beam will tend to reduce this deflection, it can in no measure begin to compensate for it. It is probable that for the more highly stressed types of airplanes that the deflection exceeds 2 inches. The effect of such deflection is to nullify the gains of continuity, for as the maximum mid-span bending moment is reduced, that over the cabane strut points and sometimes across the center-section, is greatly increased.

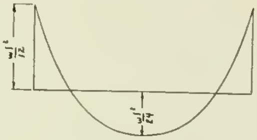


Figure 1

This will be made more clear by inspection of the curves (figures 3 to 5) which indicate the increase in cabane bending moment with increased deflection of the outer strut point. The assumed deflection of 3 inches gives an increase in cabane bending moment of about 60% over that with no deflection. Figure 6 shows the general effect of outer strut deflection, evaluated in this case by the Gough graphical method, since both the axial load and the moment of inertia of the beam sections varied along the span. In general, the effect of the presence of axial load seems to decrease the bending moment somewhat over the cabane, but the difference is small.

With the increased tendency toward wings tapered in plan-form and thickness, it has become good design practice to consider the effect of varying axial loads and varying moments of inertia of the beam sections. For beams pinned to the fuselage this is undoubtedly good design, but for beams continuous across the center-section it is not nearly so important as consideration of the deflections of the outer strut point. Such refinement without considering the effect of movement of the outer support may give to the design a false sense of accuracy.

The following table, the values of which were taken for a lower front wing beam pinned at the fuselage, illustrates this effect.

Case	P_{axial}	I	M_{max}	Δ	Δ%
1	average	average	24300	+660	+2.8
2	average	varying	23360	—280	—1.2
3	varying	varying	23640	0	0

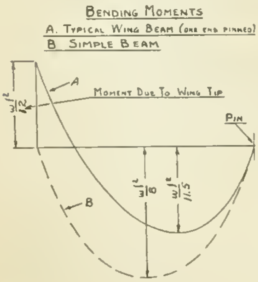


Figure 2

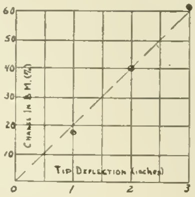


Figure 3

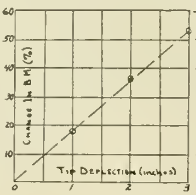


Figure 4

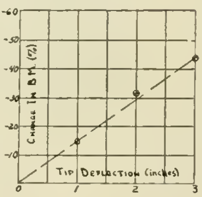


Figure 5

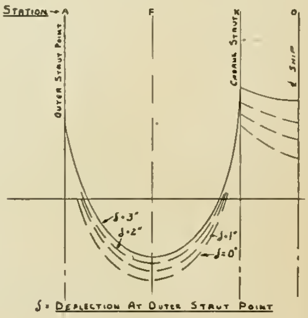
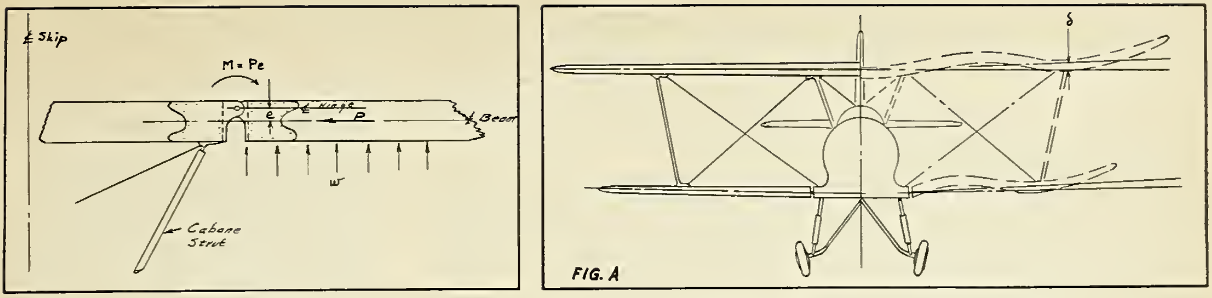


Figure 6



Offsetting a hinge to get continuity effect. Fig. A shows deflection of wing under load (exaggerated)

These values were obtained graphically by the same method as that used for the values of figures 3 to 5. It will be seen that the effect of assuming average values for the moments of inertia and for axial load is to increase the maximum mid-span bending moment by about 3% of the values obtained when using the varying quantities. Varying I and P separately produces even less effect. In any case, the effect on the bending moment is small.

A consideration of these few figures, while by no means conclusive, suggests the following:

(1) That the effect of assuming an average value for axial load and moment of inertia is small.

(2) That the effect of tip deflection is large and must be considered in the design of continuous beams.

(3) That the gains usually assigned to continuous beams are not as great as generally assumed.

It might be advantageous at this point to consider some generalized aspects of this phase of beam design. The figures given are taken from two separate designs and probably do not furnish the best illustration. The very small effect of varying the moment of inertia and axial load cannot be accepted without further verification, for values as high as 30% are reported. On the other hand, increase in cabane bending moments of 100% are also given, indicating that the figures given in these notes may be lower in both cases than are sometimes found. The relative weight to be given to the effect of varying the characteristics of the wing beam and the change in stress is a matter to suit the individual case. The figures given here can in no way be considered general enough to provide a quantitative design criterion. However, they do indicate what may be expected and suggest steps that must be taken to secure a safe design.

It is not usually possible to take advantage in design of the reduction in mid-span bending moments, since a condition of high loading may be set up in which the deflection of the outer strut point is small. Such a condition might occur in a dive.

Another factor frequently neglected in design of wings with swept-back continuous beams is the presence of a bending moment, at the point where the beam changes direction, of such a nature as to cause lateral collapse of the center section. This condition is aggravated by the high axial loads existent between the cabane struts.

A solution appears in either avoiding this type of construction entirely or by using it, knowing fully its characteristics, and making adequate provision for the stresses that will be evolved. The first method has the advantages of being somewhat easier to construct and simpler to analyze, and avoiding redundant conditions. In addition, the effect of continuity can be obtained, to a considerable extent, by so offsetting the hinge pin as to cause a relieving moment along the span. This method has most of the advantages without the disadvantages, and is the path of least resistance, but occasion may arise when it is desirable to use full continuity. In this case the effect of tip deflection should be taken into account by some standard analytical method. The graphical one used in the illustrations is applicable, and almost necessary, for cases where beam sections vary. For other cases, there are several analytical solutions which consider deflection of one support with reference to the others and these should be used, where possible, since they are usually easier to apply.

Finally, it should be pointed out in connection with the use of continuous beams that the short-sighted application of formulae is not sufficient, but must be accompanied by good engineering judgment and recognition of the peculiar conditions which may be set up.

Engineering Problems Associated with Flight in the Stratosphere

●

G. C. SULLIVAN and B. L. CARTER

● Stratosphere flying presents many new problems to the engineer for it will require new accomplishments of engine design, air-tight cabins and special aerodynamic features.

The first difficulty to be surmounted is to devise some practical method by which a carburetor can be fed with a sea level combustion mixture, providing that an internal combustion engine is used. An engine must be so designed that the power developed at high altitudes will be as near as possible to its rated horsepower at sea level. Internal combustion engines are not suitable for stratospheric flight at the present time, because their power is so closely related to the density of the air. The indicated power of such engines is proportional to the weight of the air drawn in per unit of time, but since this air must be accumulated at a constant volume during each cycle, the indicated power is itself proportional to the density of the air.

On the other hand, the mechanical losses may be considered independently of the indicated horsepower. For this reason, as the altitude increases, the effective power of an ordinary explosion engine decreases. It has been found that with an unsupercharged engine at about 65,000 feet the effective power of the ordinary engine becomes zero, because the indicated power barely offsets the mechanical losses. Probably the best means of increasing this effective power at high altitudes is by the use of the supercharger, but even in this case there is a limit to its usefulness due to the enormous horsepower loss in actuating the superchargers.

Another theoretical solution to take the place of the supercharger is to increase the compression ratio as the density is decreased, thus keeping the power constant at various altitudes. However, this solution presents excessive mechanical difficulties, aside from the fact that there difficulties, aside from the fact that there would always be a practical limit in the reduction of the volume of the combustion chamber.

A third solution, and perhaps the best from the theoretical standpoint, is the use of the turbocompressor, which comprises a turbine driven by the exhaust gases and convected with a centrifugal compressor. The higher pressure of the exhaust gases (as compared with that of the atmosphere) is thus utilized, so that the angular velocity and the power supplied to the compressor increase with the altitude, while the power furnished by the engine remains constant. Nevertheless, in the light of recent experience, the system is not recommended, especially because of the excessive peripheral velocities necessarily attained by turbines and for the high temperatures reached by turbine blades.

Possibility of Steam Power

A proposed fourth solution is the adoption of steam engines for airplanes designed to fly at very high altitudes. Although the power furnished by steam engines is also affected by the weight of the air inducted per unit of time, in order to keep this weight constant it is unnecessary to resort to compressors. It is sufficient to increase, as the altitude increases, the opening of the air inlet valve or the intake velocity, the latter being accomplished in part automatically by the effect of the greater translational speed of the airplane at high altitudes. The power furnished by steam engines can therefore be kept constant to any altitude, at least so long as there is enough oxygen in the atmosphere. The low temperatures existing at high altitudes, together with the high translational speed, would facilitate condensation of the steam and thus appreciably increase the engine's power and efficiency. Some of the first attempts of man to fly were made with steam engines, which because of their excessive weights and high specific fuel consumption were abandoned, but with the present progress in engineering science, these difficulties should be readily solved.

Another method of propulsion is by the use of rockets upon which a great deal of research has been done, but with little success up to the present time. The rocket is an engine which propels itself by disintegrating, and rejecting the particles thrown off in the form of gas. The speed of the rocket is expressed as,

$$u = c_{\log} (M + m_o) / (M + m_t) \qquad (1)$$

where c is the jet velocity, M the mass of the structure and load, m_t the mass of the unburned fuel, and m_o the original mass of the fuel. When the fuel is entirely consumed the rocket reaches its highest velocity,

$$u_{\max} = c_{\log} (1 + m_o/M) \qquad (2)$$

For the rocket to attain high speeds it is essential for it to have a high jet velocity and a small tare weight compared to the weight of the fuel carried. In the above formula a factor of 0.6 must be introduced as it can be shown by experiment on models that the efficiency is about 60%.

The following table shows the maximum jet speeds (in feet per second) attainable with fuels now available (assuming a thermal efficiency of 100%):

Fuel	Velocity
Nitro-cellulose (smokeless powder)	8,700
Alcohol with oxygen	14,600
Hydrogen with oxygen (product-steam)	17,000
Hydrogen with oxygen (product-water)	18,400
Hydrogen with oxygen (product-ice)	18,500

Experiments show that the thermal efficiency of a rocket is about 75%. Then, with the combustion chambers fed by liquid fuel burning at considerable rate, rockets can give a constant jet velocity of about 13,100 ft./sec.

As the exhaust gases fill the reduced pressure area behind the stern, the induced drag is decreased, but the drag coefficient increases at high speeds due to skin friction. Skin friction places an upper limit on the speed attainable, barring mechanical difficulties, namely, the speed at which the heat generated by friction would make it unbearable for the occupants of the projectile. Experiment has shown that a rocket is just as effective in a vacuum as in air at normal pressure.

Cabin Design an Interesting Problem

For stratospheric flight a sealed cabin must be provided, supplied with artificial atmosphere by air compressors or oxygen tanks, from which flying controls can be operated with certainty and ease. It is not sufficient to resort to oxygen inhalers and electrically-heated garments, but it is necessary to create a habitation in which the conditions of pressure and temperature shall at least be those of an altitude at which one can live without discomfort. This will be of great interest to the engineers, as the question of weight, safety and economy must be taken into consideration.

The high-altitude ship will have the following characteristics:

(1) A well-designed wing with an accurately determined wing loading. Any possible reduction in this will increase the flight altitude, for at high altitudes it becomes necessary to increase the area of the wing in order to keep the same velocity and lift. This means that the load carried per square foot of wing area is reduced as shown by the formula,

$$\text{Lift} = C_L \rho /2 \, A \, V^2$$

where ρ is the density, A the wing area and V the flight velocity.

If the airplane is flown at a high velocity (which is the reason for flying in the stratosphere) another factor must be considered—the effect on lift and drag on an airfoil as the velocity approaches that of sound. Tests on airfoils at high speeds show a decreasing C_L and an increasing C_D with an increasing ratio of velocity of flight to that of sound. The effect is the more pronounced the thicker the section. Since the velocities near the leading edge of a wing are several times the velocity of flight, there are localities on the upper surface where the velocity of sound is attained or exceeded even at comparatively low speeds, especially with thick sections. To maintain a relatively high lift, then, it would be necessary to have a very thin, highly-cambered wing.

Most Efficient Wing Design

In line with the matter of thin wings, tests have shown that at high flight velocities the drag of a body is determined entirely by the projected area on a plane perpendicular to the wind stream. Therefore, a compromise must be made, so that the projected area of the highly-cambered wing does not inordinately increase the drag and so that the L/D ratio will be at a maximum.

From the formula

$$C_{d1} = C_L^2 A / \text{Pi} S^2$$

(where C_{d1} is the induced drag and S^2/A is the aspect ratio) the induced drag is observed as inversely proportional to the aspect ratio.

Summarizing the characteristics of a high-altitude, high-velocity airplane wing we find that it must be thin, of moderately cambered, high aspect ratio, and have a high L/D ratio. Any excess wing area only serves to increase the drag at a rate exceeding that of the V^2 law, thus requiring more power to attain any desired flight velocity.

(2) The structural drag will be reduced to a minimum by cleanness in design, and does not offer as great a problem as some of the other factors under consideration.

(3) A large diameter, controllable-pitch propeller by means of which the P/D ratio can be regulated to a certain speed to give maximum efficiency. Since with increases in altitude the atmosphere becomes rarified, the propeller speed increases with constant power and to prevent racing the engine propeller characteristics must be changed. It is possible to vary the pitch, the diameter and the number of blades, but at present variation of the pitch seems the most practical method. In this way, the practical efficiency of the propeller can be attained at all altitudes.

Propeller Effect in a Dive

●

T. C. BENNETT

● The subject of terminal velocity and terminal velocity dives discussed in the February issue of AERO DIGEST by Howell W. Miller, is interesting and important to designers, although it is likely to be more important to the builder of military rather than commercial aircraft.

The importance of terminal speed in a dive lies in the fact that frequently the tail load required for balance in this flight condition furnishes the design load on the tail. A similar thing may be true of the wing beams, also. Inasmuch as the loads imposed on both the wings and tail will vary with the square of the speed in a dive, it is important, from an economical structural design standpoint, that the speed be determined carefully.

For this reason it is usually not permissible to consider the propeller thrust as being zero in a dive as was done in the original article. The correction for propeller effect on the drag is made, it is believed, in the terminal dive calculations for both the Army and the Navy. It is usually customary, also, to consider the reduction in drag because of the absence of the induced drag due to lift. This latter effect is small, but can easily be taken care of, if desired, by the following method.

The induced drag coefficient is given by $\frac{125 L^2_c}{A.R.}$, and the aspect ratio, A. R., is given by $\frac{B^2}{S}$, so that the total induced drag may be written

$$\frac{125 L^2_c S}{B^2} \cdot S V^2 = \frac{125 W^2}{B^2 V^2} \quad .... (1)$$

The original data given were

Gross weight, $W = 2600$ lbs.
Engine power, $HP = 420$
High speed, $V_{max} = 180$ m.p.h.
Propeller efficiency, $\eta = 80\%$

To these data have been added the following which have been selected as best fitting the example

Propeller diameter, $D = 9$ ft.
Propeller speed, $N = 2000$ r.p.m.
Ratio propeller pitch/diam., $P/D = 0.7$
Ratio max. blade width/diam., $b/D = 0.075$
Span of wing, $B = 30$ ft.

From the above and equation (1), the total induced drag becomes

$$\frac{125 \times 2600^2}{30^2 \times 180^2} = 29 \text{ lb.}$$

This is approximately 4% of the total drag (700 lbs.), and is probably negligible. In some cases, however, values of induced drag of 7 to 8 per cent are not uncommon. Despite the fact that the induced drag should theoretically be subtracted from the total drag, there are good practical reasons for leaving it untouched; the attitude of the airplane is not always that corresponding to minimum drag, and in addition the drag of the horizontal tail surfaces is usually greater because of the greater elevator deflection.

In order to show the effect on the terminal speed by omitting the propeller drag, the example used by Mr. Miller has been recomputed.

Negative propeller thrust, according to Diehl, is

$$C_D \frac{\rho}{2} \frac{b}{D} D^2 V^2 \quad .... (2)$$

which for this example

$$= \frac{.002378}{2} \times .075 \times 9^2 C_D V^2 = .00722 C_D V^2$$

The value of C_D is determined from the relationship $\frac{ND}{V}$ and curves given in Diehl's *Engineering Aerodynamics.*

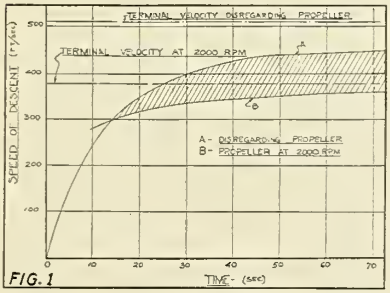


FIG. 1

Table 1 corresponds to that given in the original article but takes into account the propeller drag computed at an engine speed of 2,000 r.p.m. The quantities in the table were computed from

Airplane drag $= .02155 V^2$
Propeller thrust $= .00722 C_D V^2$
Acceleration, $a = (W - R)g/W$
Time, $t = v/a$

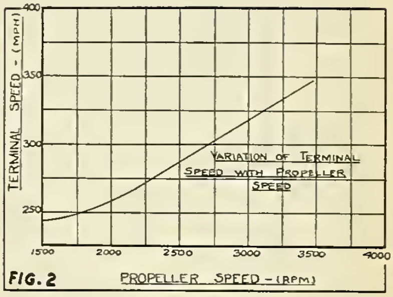


FIG. 2

The effect of propeller drag is shown graphically in Fig. 1. At a speed of 200 m.p.h. (293.5 ft. per sec.) there is no effect from the propeller, but at higher speeds the negative propeller thrust becomes of increasing importance. At terminal speeds the difference is about 25%. The difference between terminal speeds with and without propeller drag is 90 m.p.h., probably high, since typical values are more apt to be 50 m.p.h.

It is interesting to note that the drag of an idling propeller is greater than the drag of a "dead" propeller, and that the drag of "dead" propeller at the original terminal velocity of 347.5 m.p.h. would be nearly 1,400 lbs., or more than half the weight of the airplane.

The height of drop of an airplane in a vertical dive is given by the integral of the area under the speed-time curve, so that the effect of propeller drag on the distance covered in a dive is apparent from a consideration of the areas under the two curves in Fig. 1.

The effect of engine speed on the terminal velocity of the airplane is shown in Fig. 2. Due to the drag of the propeller, the terminal velocity of the airplane increases with the increase in propeller speed in a substantially linear fashion. For the propeller assumed to be fitted to this airplane and at the original terminal velocity of 347.5 m.p.h., the required engine speed would be 3,470 r.p.m. Obviously this is higher than is permissible, the upper limit in engine speeds generally being below 3,000 r.p.m.

From this simple example is apparent the necessity for considering, because of the very appreciable reductions in loads possible, the propeller drag in terminal velocity dives.

TABLE 1

V(mph)	V(ft./sec.)	Airplane Drag	C_D	Propeller Thrust	Total Drag, R	Net Force	Acceleration, a	Time, t
200	293.5	863	0	0	863	1737	21.5	13.65
225	330	1091	—.58	—456	1547	1053	13.05	25.3
240	352	1240	—.85	—760	2000	600	7.44	47.4
250	366.5	1345	—.95	—921	2266	334	4.14	88.6
255	374.5	1400	—1.05	—1062	2462	138	1.71	219.0
257	377	1423	—1.10	—1130	2553	47	...	...

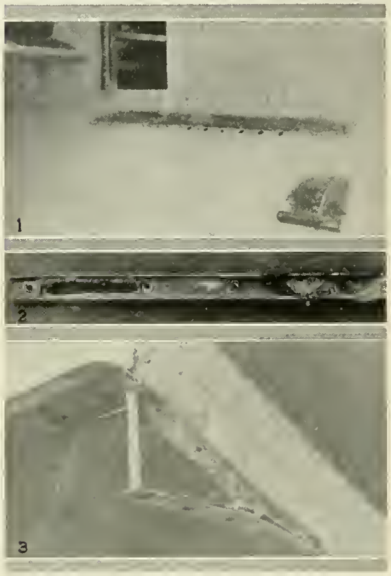
Influence of Tropical Climates on Airplanes

I. W. MILLER

● There is an immense difference between operating and maintaining aircraft in temperate climates and in tropical climates. Such operation and maintenance in the tropics is, in some respects, easier than in the temperate zones. For instance, the discomforts and handicaps of working under inclement conditions are absent. No provision need be made for heating lubricating oil or for providing proper facilities to insure prompt and easy engine starting. On the other hand, there are many difficulties in operating in the lower latitudes that are not realized by the manufacturers of aeronautical equipment, referring to such equipment which must operate under tropical conditions for any length of time. Tropical climate has extremes of moisture and high temperatures, with a close proximity to salt water. To one unfamiliar with these conditions it is a revelation how quickly these forces can accomplish deterioration in aircraft.

Relative Values of Materials

Of the structural materials usually employed in airplanes—wood, steel, and aluminum alloys, wood is the worst in the point of rapid deterioration, with aluminum alloy next in order. Of course, there are protagonists of aluminum who will point to the laboratory tests as proof that aluminum alloys are equal in corrosion resistance to any other metal used as a structural material. This is seldom true in actual service, however. With wood it is almost impossible to provide a suitable protective covering which will prevent expansion and contraction due to excessive humidity. In addition, dampness accelerates the formation of molds and other fungous growths. It is recommended that wood construction be given two coats of a wood filler followed by four coats of spar varnish. The last coat of varnish should be sprayed on after the structure is assembled, when all fittings are in place. Particular attention must be given to locations where the wood is cut across the grain. Varnish is recommended because its transparency facilitates inspection. Where doped fabric comes in contact with wood a separating medium of aluminum foil is essential, to prevent the dope lifting the varnish. This foil is more difficult to apply than a dope-proof paint but it is better insulation against moisture. Wing beams of the solid type are preferred to the built-up type because they are found to be less susceptible to the deteriorating influences of the climate, and because they are easier to repair. Glued joints should be well protected against the dampness as soon as the joint is dry. Glues, paints and varnishes are quickly impaired by the action of sunlight and moisture.



Effects of corrosion on flying boat parts, in tropical waters

The material best suited for the primary structure of aircraft destined for use in tropical climates is steel. Its advantages over aluminum alloys lies in the more effective resistance to corrosion and greater ease of repair. Mechanics capable of handling steel are more available than those who understand the use and limitations of aluminum alloy. The writer has had considerable experience with both materials, and while he realizes that both have advantages and disadvantages, experience proves the relative desirability of steel construction. The built-up or pin-jointed structure is to be preferred to the welded type of structure. Local repairs can be made more quickly, at less expense and with less elaborate equipment. The average mechanic can replace a strut or fitting, while satisfactory welders are difficult to find in many localities. On one occasion the writer remembers the necessity of rebuilding the tail structures of several ships under conditions in which the facilities were very meager. The structure was a riveted job and the replacement was made with comparatively little trouble. Engine mounts of the welded type are to be preferred to the built-up type since they provide the necessary rigidity and are rarely susceptible to damage.

In providing a finish for steel, adequate protection for the interior must be insured by an application of a hot oil, such as linseed. The outside should be thoroughly cleaned and given three coats of a red-oxide primer followed by three coats of a good enamel, sprayed on. The disadvantage of an enamel is its likelihood to chip if struck by tools, etc. A more flexible covering, such as a pyroxylyn lacquer, would be satisfactory in such cases. The writer has had no experience with any of the proprietary finishing operations of the "bonderizing" or "parkerizing" type work but, no doubt, they would be beneficial in corrosion prevention. In all erection and assembly, frayed surfaces should first be insulated. Bituminous or asphaltum paint is satisfactory for this purpose.

Aluminum and its alloys seem best adapted as a covering for a main structure of wood or steel. In such uses Alclad and the anodic treatment for preventing corrosion are satisfactory. The advantage enjoyed by this covering is that it is easily inspected and repaired. An aluminum alloy must be used as a covering for a boat or amphibion hull on account of its lightness in weight. The operator of an aircraft is not concerned with the method employed by the manufacturer of the alloy in corrosion prevention; his task is to take the material furnished, keep corrosion to a minimum and make any repairs that may be needed. In repairs using rivets care must be exercised in the proper heat treatment of the particular alloy of which the rivet is made, as this treatment has a great effect upon the preservation of the rivet. A dab of non-corrosive paint should be placed in the rivet hole before inserting the rivet.

Methods of Surface Protection

Several methods of protecting the surface of the above material are all relatively satisfactory. These comprise oil paints, bitumastic and asphaltum paints, varnishes and grease. The last is efficient but not for exposed surfaces or in a hot climate. Grease or petroleum mixed and melted with sufficient bees-wax makes a fine coating for fittings and other exposed parts as it does not flow and has considerable resistance to wear. It is unsightly, however, and should be removed frequently to permit inspection.

Figure 1 shows advanced corrosion where a wood strip was in contact with aluminum alloy. Figure 2 shows an aluminum alloy fitting which had been in use on the side of an amphibion hull for about 400 hours of flying. To a cursory view it appeared intact, until the outside protective covering and the flake corrosion were removed. Figure 3 shows corrosion existing near the step of an amphibion hull. In both cases there was little outside evidence of serious corrosion.

Dry Surfaces Will Not Corrode

For underwater work a flexible bituminous or asphalt paint is recommended. Two thin coats should be applied and frequent inspections made to insure the integrity of the surface covering. For non-submerged surfaces, enamel or an aluminum pigmented varnish is satisfactory. Interiors of hulls and floats are well protected by a bituminous or asphalt paint mixed with aluminum powder which produces a light-colored and easily inspected interior. If the mechanics are impressed with the knowledge that dry aluminum or any of its alloys will not corrode and that if all surfaces are kept dry, then corrosion will be reduced to a minimum. Designers can help in this phase of maintenance work by providing adequate drainage. This applies to the interior of the wings also. If a structure is not absolutely waterproof inspection plates of a sufficient number and size should be provided. There should be no projecting screw or rivet heads which are hard to keep covered with a protective covering; flat countersunk heads are more advisable.

Protecting the Joints

Where there are joints, both surfaces should be waterproofed before assembly. This is true whether the joints are metal-to-metal or metal-to-wood. A strip of fabric soaked in bituminous paint or marine glue placed between the surfaces is efficient. If this is not practicable, paint may be applied directly to the metal. The above procedure should be carefully carried out where aluminum alloy and a dissimilar metal are joined to prevent corrosion due to electrolytic action. This type of corrosion is particularly rapid where a copper alloy is the dissimilar metal, and where moisture is present. An efficient insulating medium between wood and aluminum is a strip of oiled or waxed paper.

In seaplane operations washing and flushing with fresh water as soon as possible after the completion of a flight is a good deterrent to corrosion.

The airfoil covering materials in order of their suitability for tropical service are: aluminum alloy, fabric and plywood. Fabric has the advantage of being cheaper and easier to apply. Of the fabrics the mercerized cotton is less susceptible to changes in tautness due to changes in atmospheric humidity. Ultraviolet and actinic rays of the sun are the chief influence in fabric's deterioration and for that reason an opaque covering is to be desired. There are any number of good lacquers which are excellent for this purpose. They are more satisfactory than the aluminum pigmented dope. Adequate drainage and ventilation should be provided for the airfoils and the wing covering elsewhere should be arranged so as to prevent the entrance of water.

Tropics Damaging to Brake System

Many brakes on airplanes today are in much the same status in regard to weatherproofing as automobile brakes were a few years ago. In the case of large planes for which hangar space cannot always be procured it is no novelty to find that the brakes are useless after a tropical rainstorm. While on this subject it might be well to mention that engine and aircraft manufacturers have a field for improvement in weatherproofing their engine installations. In the tropics where sudden and violent rainstorms are frequent this is important.

Airplane accessories such as tires, rubber shock absorbers, pyralin, shatterproof glass, etc., deteriorate more quickly in extremely hot climates. A large stock of tires and hose is not as advisable for spares as a small and fresher stock. For the same reasons an oleo or pneumatic shock absorbing system is preferable to one utilizing rubber. The adhesive binder between the layers of safety glass quickly discolors and disappears under a tropical sun. Engine and plane accessories must be protected against moisture and other influences which are entirely foreign to operations in a more temperate climate. Ignition equipment is susceptible to a combination of heat and moisture. Atmospheric humidity is sometimes the cause of magnetos and generators breaking down. During the rainy season it is necessary to provide suitable damp-proof storage facilities for such parts. An air-tight closet or compartment which is kept heated by electric light bulbs is satisfactory.

Protective Covering for Engine Parts

All collector rings and housings, distributor cylinders and blocks, insulating plates, coils and insulation should be thoroughly dried and a protective covering such as "Glyptol" and thinner in equal parts applied and baked for several hours at 150°-160°F. Generator and starting motor armatures and coils should be treated in a similar manner. Electrical wiring and connections deteriorate rapidly and require more frequent inspection and replacement than usual.

When not in use all venturis on instruments and air speed indicators should be kept covered to prevent the entrance of small wasp-like insects. Insects also enter openings in wings and while their actual presence is of no particular harm, their nests, which are composed of mud, promote rust on metal and rotting in wood. Carburetors require frequent cleaning in tropical climates, particularly when they have been used near salt water. An aluminum hydroxide or similar deposit quickly forms under such conditions and sometimes affects the mixture control, rendering it inoperative. There have been occasions where such conditions caused carburetors to become excessively rich.

Ice Formation Even in the Tropics

It may seem strange to speak of ice formation in tropical climates, but we are referring to ice in the intake system and not ice on the wings. At an altitude of 10,000 feet or thereabouts temperatures of 50° to 55°F. are not unusual. In a damp or excessively humid climate this offers a favorable condition for the formation of ice in the intake. The presence of ice has been definitely established by the fact that there are frequent cases where impeller blades are found to be chipped when an engine is torn down for overhaul. The possibility that some other agency such as small stones rather than ice was the cause is obviated by the presence of a screen on the air scoop on the carburetor. For this reason a manually operated carburetor heater should be provided. At low altitude it could be made inoperative in order to permit the engine to operate at a lower temperature. Such heaters are readily obtainable but it is usually the custom to remove them in warm climates.

Products Should Be Adapted to Tropics

For regulating oil temperature, an oil radiator placed outside the engine cowl is suggested. There should be a shutter or by-pass capable of being operated from the cockpit. The above system is much more efficient than a system which requires the use of a regulator in the intake.

Many manufacturers of airplanes do not seem to adapt their products for service in the tropics. Perhaps the added manufacturing cost has some influence upon this but it would seem that if proper preparations be made for severe climatic conditions there would be less work for maintenance crews in more temperate regions. There is a large field for aircraft in the tropics and manufacturers who incorporate features for such use in their planes will have additional selling points for their products.

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AMERICAN AIRWAYS

Over the Mountains and Across the Desert..

WRIGHT Cyclones power American Airways' fleet of Curtiss-Wright Condor Sleeping Planes. The first installation of this deluxe equipment was recently made on the Dallas-Fort Worth and Los Angeles Division of American Airways.

Over the mountains and across the desert at 160 to 190 miles per hour. Luxurious berths for night flight . . . spacious club chairs for day flight, are features that permit complete relaxation and eliminate the fatigue which usually accompanies extensive transcontinental travel.

The new Curtiss-Wright Condor Sleeping Planes are powered by two Wright "Cyclones" which develop 1430 h.p. at 1950 revolutions per minute. With both engines in operation, the planes have a service ceiling of more than 18,000 feet and a cruising radius of 725 miles, with a gasoline capacity of 375 gallons. They are capable of completing a take-off with a single engine and climbing to 8,000 feet altitude on one engine.

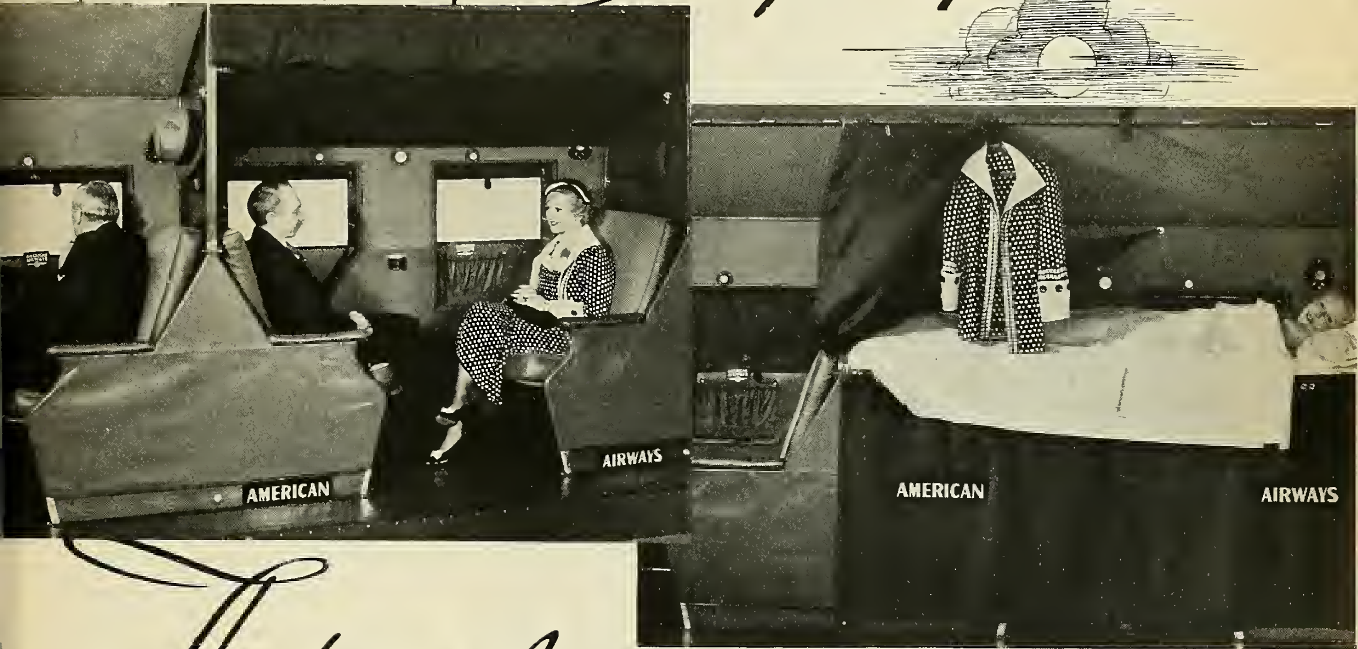
American Airways operates millions of miles annually with Wright Cyclone-powered equipment over its Coast-to-Coast, Canada-to-Mexico System. The new Sleeper Planes are the latest equipment designed to provide the public with maximum air travel facilities.

WRIGHT
AERONAUTICAL CORPORATION
PATERSON NEW JERSEY
A DIVISION OF CURTISS-WRIGHT CORPORATION

Powered by
WRIGHT
CYCLONE
715 · H.P.
ENGINES

CURTISS-WRIGHT CONDOR

Sleeping-Plane



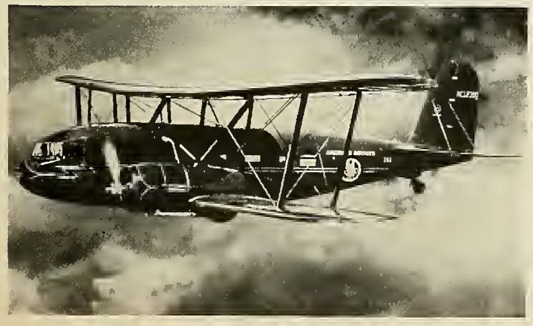
The latest Innovation of

AMERICAN AIRWAYS

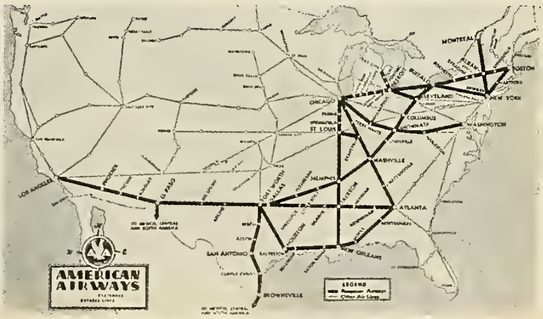
AMERICAN Airways is the world's first airline to introduce complete Flying Sleepers. The planes are an improved type of Curtiss-Wright Condor, powered by two Wright Cyclone Engines, with a top speed of 190 and a cruising speed of 160 m.p.h. They carry twelve passengers, two pilots and a steward.

The spacious upper and lower berths of these ultra-modern airliners are one inch longer than those of the standard American sleeping car. They can be quickly converted in flight or on the ground into wide and comfortable lounge chairs. Each berth is as fully equipped as the deluxe compartments of a transcontinental train or ocean liner. The first two planes of a fleet of six Curtiss-Wright Condor Sleepers were recently placed in service on American Airways' division between Dallas-Fort Worth and Los Angeles. They have established a new high standard of air transportation for the personal comfort of American Airways' rapidly increasing patronage.

American Airways has purchased twenty-five Curtiss-Wright Condors during the past twelve months for use on the following divisions of its "Nationwide Network of Airlines"—Chicago-New York, New York-Boston, Cleveland-Dallas-Fort Worth, and Dallas-Los Angeles.



Curtiss-Wright Condor Sleeper Powered by Wright Cyclones



American Airways' Coast-to-Coast Network of Airlines

CURTISS-WRIGHT AIRPLANE COMPANY

ROBERTSON — A DIVISION OF CURTISS-WRIGHT CORPORATION — MISSOURI

Digest of Technical Articles from Foreign Publications

ELSA GARDNER

Propellers

An Application of Prandtl Theory to an Airscrew, C. N. H. Lock. (British) Aeronautical Research Committee—Reports and Memoranda No. 1521, August 30, 1932 (Published January 12, 1934, 41 pp., 13 figs.

THE PROBLEM of finding the distribution of interference velocity for the propeller is solved, for a general distribution of vorticity with radius, by means of a Fourier expansion, the method being analogous to that used by Trefftz for a monoplane airfoil. The method is compared with the results of assuming the number of blades to be infinite and with the result of determining the performance of each blade element separately on the assumption that the rest of the wake has the special distribution for which the numerical solution was given by Goldstein. A formula for an approximate overall correction, given by Prandtl, is discussed and alternative formulas are included which can be used to convert from an infinite number of blades of normal plan form to two- and four-bladers of the same plan form.

Longitudinal Stability

Influence of Wing Elasticity upon the Longitudinal Stability of an Aeroplane, A. G. Pugsley. (British) Aeronautical Research Committee, Reports and Memoranda No. 1548, January 13, 1933 (Published October 30, 1933), 11 pp., 2 figs., 2 tables.

APPROXIMATE EXPRESSIONS for the effects of wing elasticity upon the relative derivatives are developed and methods of evaluating the terms involved put forward. A numerical example is followed by a general discussion of the effect of wing elasticity upon longitudinal stability. It was found that wing elasticity will normally have upon this stability a detrimental effect which will tend to be more or less dangerous as the speed of the airplane is close to or remote from the divergence speed for its wings. As practical measures for the reduction of this effect, the author recommends that the pitching-moment coefficient for the wing section should be small and the torsional stiffness of the wings large.

Engine Fuels

The Problem of Fuels for Aircraft Engines (Il problema dei carburanti per i motori d'aviazione), P. Ragazzi. L'Aerotecnica, Vol. 13, No. 12, December, 1934, pp. 1585-1645, 18 figs., bibliography.

THE PRESENT stage of investigations on both fuels and knocking for aircraft engines is reviewed. Physical properties of fuels and their importance in engine operation are examined and the phenomenon of detonation with the means by which its intensity can be measured is discussed. The author takes up the problem of anti-knock substances and gives the results of experiments with various tetraethyl lead mixtures as well as suggestions for the adaptation of engines to its use. He points out the problems of fuel mixtures for high-standard engines with some rules for their preparation, and illustrates the octane curves of usual fuels and mixtures. He concludes with an outline of the continuous improvement of aviation fuels and predicts an increasing use of tetraethyl lead.

Seaplane Design

The Constructive Evolution of Seaplanes (L'evoluzione costruttiva dell' idrovolante), F. Bonifacio. L'Aerotecnica, Vol. 13, No. 12, December, 1933, pp. 1542-1584, 9 figs.

THE DEVELOPMENT of seaplanes from the earliest experiments in 1910 to the present large types is traced. The author observes that, although the tendency of today is towards the multi-engined landplane with retractable landing gear for transcontinental lines, the problems of seaplane design are still the object of research and experiment. These problems are then examined and improvements suggested to save weight and power as well as to increase aerodynamic efficiency. Modern tendencies in seaplane construction are pointed out and the great importance of both theory and practice in the recent most successful flights emphasized. The author concludes with an outline of conditions which wide-range and high-speed transatlantic seaplanes must satisfy.

Engine Vibration

Torsiograph Investigations on a Radial Engine With and Without a Spring Hub, with Some Reference to Damping, by B. C. Carter, N. S. Muir and H. Constant. (British) Aeronautical Research Committee—Reports and Memoranda No. 1562, July 26, 1932 (Published April 11, 1934) 14 pp., 18 figs.

THE SPRING hubs used in these investigations were made as an outcome of previous torsional vibration research. Torsiograph tests were taken partly to examine the effects of the torque fluctuation in the propeller drive of fitting a spring hub, both with and without a damper incorporated, and partly to make use of the spring hub in determining the amount of damping present in the propeller system.

The observed main critical speeds with spring hubs fitted agree reasonably closely with the calculated values and the minor criticals occur at speeds which agree closely with the critical speeds calculated from the main critical speeds.

The effect of fitting an engine with a spring hub incorporating a suitable damper is to remove practically all trace of torque fluctuation in the propeller shaft at all speeds.

The provision of stops does not serve nearly as well as the provision of a damper and it is doubtful whether stops are needed when a damper is provided. If fitted, they should be so arranged that they do not come into contact with spring arms, but should operate between rigid portions on the driving and driven sides of the springs, and the clearance given should be such as to prevent the springs from being over-stressed through accidental circumstances.

The degree of damping indicated by theory as being requisite is effective and it can be obtained with a solid friction cone damper of moderate size, loaded by propeller thrust.

Wooden Construction

Assemblies of Wood (Les assemblages de bois). M. Monnin. Publications Scientifiques et Techniques du Ministère de L'Air, Service des Recherches de L'Aèronautique, 1933, No. 37, 104 pp., 42 figs., 48 additional figs. on supplementary plates.

PROBLEMS OF wooden construction for aircraft are taken up in detail. The first and second parts deal with the general conditions of assemblies and the problem of wood, while the third, in discussing the problem of dope, reviews the physical characteristics of wood, how the mechanical characteristics are modified by humidity, and the stabilization of play and resistances.

The problem of gluing wooden assemblies is taken up in the fourth part and that of bolts in the fifth. The last part is devoted to fittings and gives as limiting conditions the uniformity of resistances and elongation of the wood. The author describes solid and cut-out sections and wood fittings, pointing out the relative thickness for assembly pins in tension and the relative length for compressed buckled fittings. He concludes that, for equal weight, wood, if properly conditioned, correctly used, glued, doped, assembled and joined by forces in equilibrium, is superior to all other materials for aircraft construction from the standpoint of resistance, convenience, durability and safety.

Turbine Wing

The Present and Future of an Airplane with a Tubular Fuselage, (Il presente e l'avvenire dell'aeroplano a fusoliera tubolare), L. Stipa. L'Aerotecnica, Vol. 13, No. 11, November, 1933, pp. 1401-1450, 56 figs.

VARIOUS METHODS of intubing a propeller are described and compared with that of the author's. Results of a series of experiments are set forth to determine the form of a tube enclosing the wake of a propeller and new results obtained with propellers intubed in various forms of tubes are given. The Caproni airplane with a tubular fuselage, is considered and results of its flight tests compared with those obtained with conventional airplanes. The author concludes that better results can be secured with larger airplanes having tubular fuselages and gives some designs he has made for future tests.

Supercharged Engines

Engines with Superchargers (Motori muniti di compressore), D. Cosci. L'Aerotecnica, Vol. 13, No. 11, November, 1933, pp. 1451-1478, 16 figs., 1 table.

TWO WAYS of maintaining constant aircraft-engine power up to a given altitude, namely, by increasing the compression ratio and by supercharging the engine are discussed. The author points out the advantages of the latter and describes types of centrifugal and volumetric superchargers in use at present, giving the design of a supercharger driven by an exhaust-gas turbine. He calculates the power absorbed in compressing air at various altitudes to keep it at one atmosphere and determines how the absolute ceiling and the velocity of an airplane would be increased if the power of its engine were maintained constant with altitude.

Recent Patents

The following patents of interest to readers of Aero Digest recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

Airplane cowl fastener. George W. Pancoe, Brooktondale, N. Y., assignor to Thomas-Morse Aircraft Corp. (1,949,027)

Means for indicating height of aircraft, particularly for use when aircraft is landing. David F. Lucking, Felixstowe, England. (1,949,166)

Aircraft with rotative wings. Juan de la Cierva, assignor to Autogiro Co. (1,949,296)

Aircraft. George W. Hardin, Greeneville, Penn. (1,949,304)

Aircraft sustaining rotor; aircraft having freely rotative wings, and aircraft of the rotative wing type. Juan de la Cierva, Madrid, Spain, assignor to Autogiro Co. of America. (1,949,410; 1,949,785 and 1,950,080)

Propeller blade. Fred J. Martens and Clinton O. Thompson, Milwaukee, Wis. (1,949,611)

Propeller mounting. Frederick Charavay, Piqua, Ohio, assignor of one-half to Hartzell Industries, Inc., same place. (1,949,737)

Airplane. Thomas Dugan, Wichita, Kan. (1,949,787)

Truss member for aircraft and like. John P. Tarbox, Philadelphia, Pa., assignor to Edw. G. Budd Mfg. Co. (1,949,818)

Means for assisting in mooring Zeppelins and like. Noel Statham, Irvington-on-the-Hudson, N. Y. (1,949,888)

Helicopter or wingless air vehicle. August J. Ellison, Detroit, Mich. (1,949,995)

Variable-pitch screw propeller. Ettore Lanzerotti, deceased, late of London, England. (1,950,117)

Sustaining blade for aircraft rotors. Agnew E. Larsen, Huntington Valley, Pa., assignor to Autogiro Co. (1,950,411)

Cradle (for aircraft floats). Lisle J. Maxson, Lieutenant, Construction Corps, U. S. Navy, and Frederick B. Gross, McLean, Va. (1,950,413)

Aircraft. Edward B. Wilford, Merion Station, Pa. (1,950,424)

Device combining lift, propulsion, and autopropulsion for aircraft. Jean Lado-Bordowsky, Boulogne-sur-Seine, France. (1,950,915)

Navigational instrument. Nicolai Minorsky, Swarthmore, Pa., assignor to Pioneer Instrument Co. (1,950,946)

Airplane clock setting mechanism. Otto F. Deck, Brooklyn, N. Y., assignor to A. Wittnauer & Co., New York, N. Y. (1,951,010)

Variable-pitch propeller and blade retention device. Werner J. Blanchard, Hempstead, N. Y., assignor to Curtiss Aeroplane & Motor Co. (1,951,320 and 1,951,321)

Method and apparatus for strengthening framework and covering of airships. Garland Fulton, Cincinnati, Ohio. (1,951,353)

Aircraft. Charles A. Wragg, Strand, London, England. (1,951,464)

Airplane helicopter. Earle E. Blount, Dayton, Ohio. (1,951,817)

Parachute. Louis L. Driggs, Jr., Tippecanoe City, Ohio, assignor to International Flare Signal Co., same place. (1,951,864)

Altimeter. Fidel Cordero, Takoma Park, Md., and Atherton H. Mears, Philadelphia, Pa. (1,952,037)

Method of adding metal to finished propeller blades. James H. McKee, Pittsburgh, Pa., assignor to Pittsburgh Screw & Bolt Corp. (1,952,086)

Airplane. Joseph Emmi, Jr., Syracuse, N. Y. (1,952,242)

Propeller blade adjusting system. Joseph J. Ring, Wauwatosa, Wis., assignor to Allis-Chalmers Mfg. Co. (1,952,566)

Method of making propellers. Marshall A. Smith, Jr., South Bend, Ind., assignor to Bendix Research Corp. (1,952,569)

Airplane baggage compartment. Giuseppe M. Bellanca, New Castle, Del. (1,952,786)

View of the engineering department of a modern aircraft factory — the Boeing plant at Seattle, Washington

General Aviation's GA-43 Seaplane

Views of the GA-43 seaplane taking off and in full flight during recent tests

● The first seaplane manufactured in the United States equipped with wing trailing edge flaps, or "airbrakes," is now undergoing final flight tests before delivery to the Scadta Airlines of Colombia, South America, where it will fly on regular schedule over the Magdalena River, carrying passengers, mail and express.

This unusually clean transport airplane is a product of the General Aviation Manufacturing Corporation of Dundalk, Md., a subsidiary of North American Aviation, Inc., affiliated with the General Motors Corp. It was described in detail in the February, 1933, issue of AERO DIGEST.

The fuselage is of semi-monocoque Alclad metal construction with smooth skin, transverse frames and longitudinal stringers of flanged Z section to facilitate service and inspection. The cross-sectional dimensions of the fuselage throughout its length are sufficiently large to permit easy and comfortable access, and there are no cross members or other obstructions. The tapered cantilever wing uses the Clark Y airfoil section.

The wing flaps are operated hydraulically by the pilot, and a flap position indicator mounted on the instrument board shows their position at all times. A safety feature of this system is the inclusion of a relief valve in the hydraulic circuit which permits the flaps to close when safe airloads are exceeded because of too high landing speed. Ailerons are of the Frise type with differential control, and statically balanced.

The cabin of this airplane comfortably accommodates ten passengers and is equipped with reclining chairs and individual ventilating and heating systems. At the rear of the cabin is a fully equipped lavatory, and directly aft of it is located a large baggage compartment of 50 cubic feet capacity. Another baggage compartment is directly under the pilots' cockpit and is accessible through an outside door. This compartment is large enough to accommodate all the baggage of the passengers, thus leaving the rear baggage compartment free for the carrying of mail or express. The pilots' cockpit, situated directly behind the engine and accessible from the passenger cabin, provides accommodation for two pilots and is so located as to allow the best possible vision. A trap door in the roof of the cockpit serves as an additional exit for the pilot. Passengers get aboard by stepping from the dock to the float and up a folding ladder into the cabin. When the airplane is loaded, the ladder folds back within the door.

It is equipped with a Pratt & Whitney engine of 700 h.p. and an all-metal controllable pitch propeller. It has a twin float arrangement with specially designed bracing to meet operating conditions of the Scadta Airlines, and has a maximum speed of over 165 m.p.h. It lands at approximately 60 m.p.h. with the airbrakes in extended position.

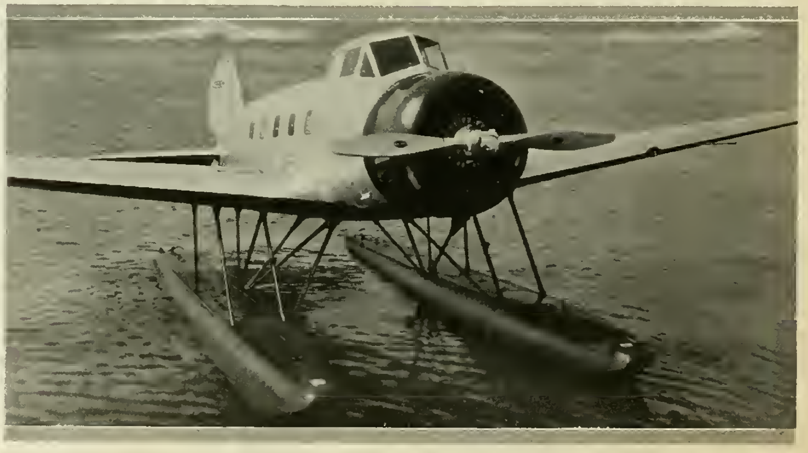
The GA-43 seaplane uses all-metal Edo model 36-9225 floats which were specially designed for it in collaboration with the engineers of the General Aviation Company and W. Schnurbusch, chief engineer of Scadta.

As indicated by the model number, each float has a total submerged displacement of 9225 pounds. The floats have an overall length of 28 ft. 9 in., a beam of 3 ft. 8½ in., and a depth of 3 ft. 1 in. Each is equipped with 7 water-tight compartments, and carries one of the usual type retractable Edo water rudders on the transom.

The attachment struts are distinguished by the fact that no spreader tubes are used between the floats, and also by the absence of the conventional streamline wires. On the GA-43, each float is independently attached to the airplane with a complete system of rigid struts.

The floats have a V bottom or a deadrise of 26° and are of the latest streamlined type, similar in appearance and general characteristics to those which Col. Lindbergh used on his Lockheed.

This airplane is the fourth of its type manufactured by the General Aviation Manufacturing Corp. for various parts of the world, and the first three planes were shipped as landplanes with retractable landing gears. One of these has been in operation over the Japan Airlines, and another in Switzerland. A third airplane was recently delivered to Western Air Express for operation over its Mid-Continent Division between Cheyenne and Albuquerque.



General Aviation GA-43 twin-float seaplane at rest on the water

NEWEST "CLIPPER"
FOR PAN AMERICAN AIRWAYS
HAS 4 THREE-BLADED HAMILTON STANDARD CONTROLLABLES

Pan American Airways may be justly proud of their newest "Clipper" —the 19-ton Sikorsky S-42—largest plane ever built in the United States. This is the first of a new series of "Clippers" that will be placed in service soon on Pan American Airways routes between North and South America.

With a cruising speed of 160 miles per hour it is expected that this new Sikorsky flying boat will provide new high speed service between Miami and Buenos Aires. She will carry a crew of six, 32 passengers and 1000 pounds of mail and express for 1,200 miles non-stop.

The selection of Hamilton Standard three-bladed Controllables for this four-motored ship marks another step in the world-wide use of Hamilton Standard Propellers as standard equipment on leading commercial lines of both hemispheres.

HAMILTON STANDARD PROPELLER COMPANY
EAST HARTFORD CONNECTICUT
SUBSIDIARY OF UNITED AIRCRAFT & TRANSPORT CORPORATION

HAMILTON STANDARD

CONTROLLABLE PITCH PROPELLERS

1200-Horsepower Deschamps Diesel Engine

● The Deschamps Diesel aircraft engine produced by D. J. Deschamps, engineer at the Lambert Engine & Machine Co., Moline, Ill., is a two-cycle, 12-cylinder inverted V-type with an output of 1200 h.p. at about 1600 r.p.m. The weight of the engine dry, but in running order, complete with all its accessories: starter, air compressor, double fuel strainer, fuel booster pumps, fuel lines, superchargers complete with air intakes with their adjustment valves, torsional vibration damper and torque limitator protecting the gear drives, and the overrunning clutches for the supercharger impeller drives, is about 2400 pounds, giving a specific weight of 2 pounds per horsepower.

Cylinders are set in two banks at a 30° V. The bore is 6 inches and the stroke 9 inches, giving a total piston displacement of 3052 cubic inches. The compression ratio is 16 to 1 and the fuel used has a gravity of Beaume 28.

The first experimental engine was made reversible so it would qualify for dirigible use as well as for airplanes, a feature which increases the weight by about 45 lbs. When used in a plane, the engine being immediately reversible, the propeller could be used as a brake to shorten the run on the ground when landing.

Cylinder blocks and the crankcase are made in a single casting to save weight and provide a rigid unit for supporting the crankshaft bearings. The crankcase is ribbed for increased stiffness and the bearing shells are held by two transversal walls giving maximum rigidity.

Cylinders are bushed with liners of nitralloy steel, hardened inside to a hardness of 900/1000 Brinell. Liners are of the "wet" type and the water jacket is sealed by rubber rings, which do not come in immediate contact with the coolant, so that Prestone, instead of water, can be used without endangering the tightness of the joints.

The exhaust collector surrounding the cylinder is supported so as to provide freedom for expansion and to eliminate strains which might distort the cylinder or produce cracks in the casting.

Cylinder heads of aluminum alloy are cast in a single unit for the 6 cylinders, while all other castings are of heat-treated magnesium alloy.

Scavenging and Exhaust

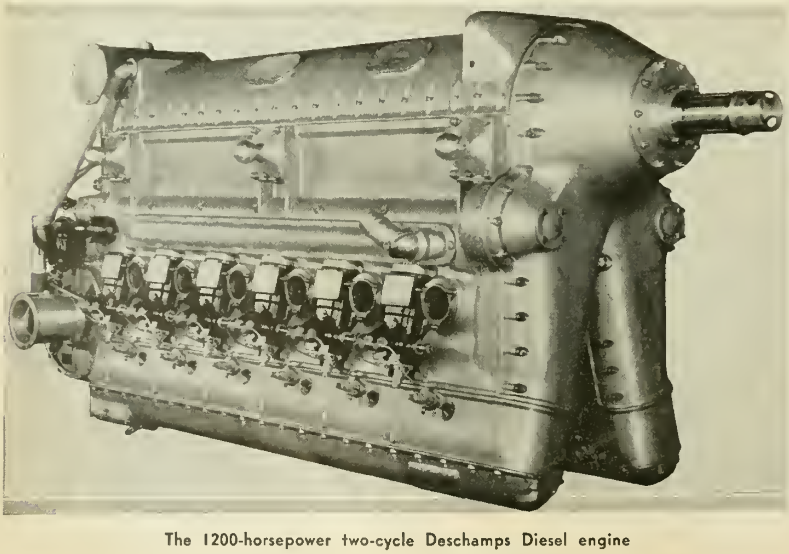
Scavenging air is obtained from two centrifugal compressors, one for each bank of cylinders. The impellers are driven at 13.5 times crankshaft speed, delivering a volume of air equal to the engine's displacement, plus 25% excess for scavenging. These compressors normally deliver scavenging air at a sea-level pressure of 12 lbs. with the air intake fully open. Tests of a two-cylinder experimental engine have shown that a pressure of 8 lbs. was required for obtaining good scavenging conditions at 1600 r.p.m. Therefore, 4 lbs. excess pressure can be used for supercharging. A butterfly valve on the air intake of the compressors permits the pilot to adjust their output.

Compressed scavenging air enters the cylinders through two poppet valves opening and closing together; two valves rather than a single valve of larger dimensions are used in order to reduce the mass, as these valves must open and close quickly.

A decompression mechanism permits the operator to displace the camshafts axially. By sliding these shafts, a cam is brought over the valves, keeping them open during the compression stroke while an automatic locking device keeps the shaft in place in one position or the other.

The exhaust gas leaves the cylinder through 12 ports in the cylinder walls at the bottom of the stroke; these ports open in a tore (or collector) surrounding the cylinder. This tore is divided in the rear so as to force the gas to travel in one direction.

Pistons are of Y alloy, and have radial ribs for cooling.



The 1200-horsepower two-cycle Deschamps Diesel engine

Fuel Injection System

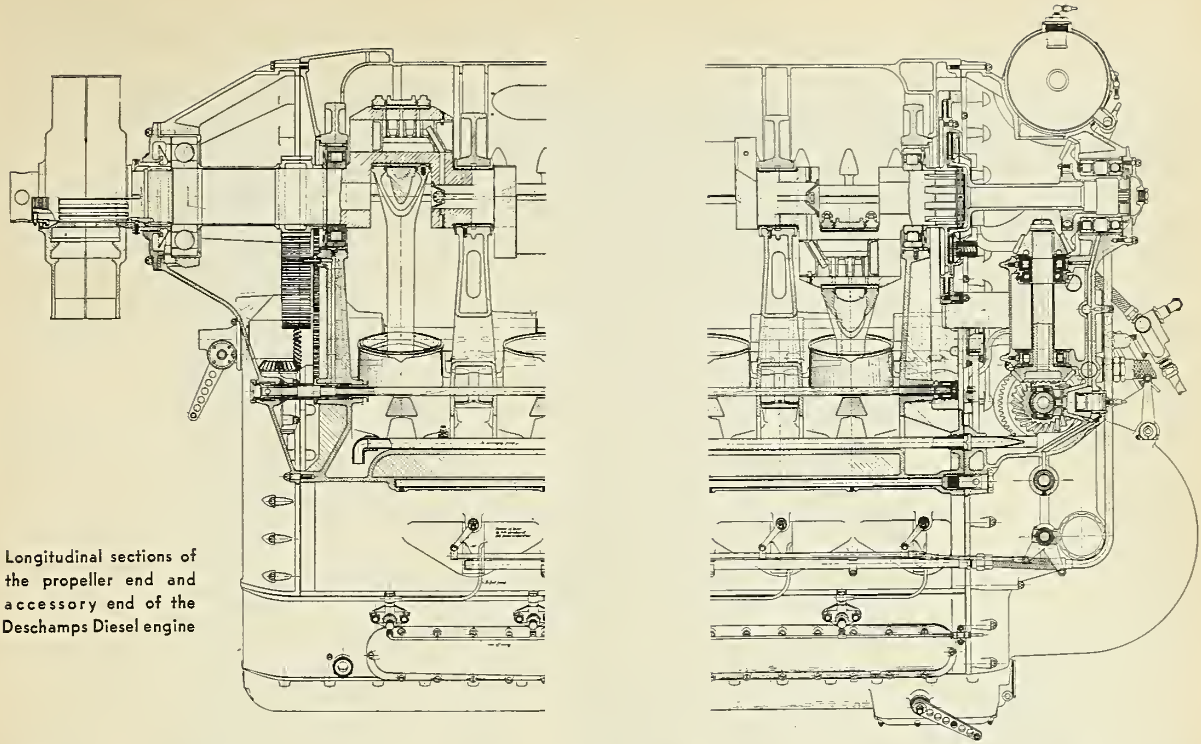
It has been difficult to operate fuel injection pumps at high speed without excessive wear on the cams and without impairing the operation of the pump itself. There are many reasons which have kept the speed of Diesel engines down to around 2000 r.p.m., and the fuel pump is one of them.

Furthermore in four-cycle engines the pump is driven at half crankshaft speed, and the difficulty is increased in a two-cycle engine where fuel injection must occur at every turn of the shaft, and thus the pump must be operated at crankshaft speed.

In order to solve this problem, a double pump is used for each cylinder, the two plungers of the fuel pump being operated in 180° phase relation. The camshaft operating the plungers turns at half crankshaft speed and the two elements of the double fuel pump deliver the fuel alternately to the cylinder nozzles.

The designer desired a pump with a fixed stroke and a by-pass fuel output adjustment, long overlapping of the ports so as to have maximum guarantee against leakage at high pressure, and no delicate fuel adjustment mechanism which wears out rapidly and changes the characteristics of the pump. It was also desired to avoid possibility of pulsation or surge in the supply line and to obtain satisfactory operation of the pump at slow speeds. In addition it was necessary to have a double barrel pump of such dimensions and shape that it easily could be installed in the location provided.

The pump finally devised to meet these



Longitudinal sections of the propeller end and accessory end of the Deschamps Diesel engine

requirements works as well at low speeds as with pressure as high as 6000 lbs., although the injection pressure now being used is only about 3500 lbs. All moving parts, and also the cylinder barrels of the fuel pump, are of nitralloy steel.

Two spray nozzles are used for each cylinder; they are placed opposite one another, staggered so that the fuel sprays enter the cylinder tangentially rather than radially, thus promoting a swirling of the compressed air in the combustion space.

Fuel supplied by the injection pumps is divided between the two nozzles, and good combustion conditions have been obtained by injecting the fuel from both sides of the cylinder. This provides a safety feature for engine operation as well as for the injection pumps.

It might be supposed that it would be difficult to balance the spring loaded valves in the nozzles so that they deliver exactly the same quantity of fuel and maintain this condition in service. Tests have shown that the slight difference occurring in practical operation has no adverse effect of any importance.

Builders of small high-speed automotive Diesel engines have encountered difficulty in running the engine at low speed and in idling it down as with a gasoline engine. Often engines can not be idled down to a speed below 500 r.p.m., because at slow speed without load, the quantity of fuel to be injected becomes so small that the injection pump can no longer handle it. This causes uneven running and finally engine stoppage.

Some designers cut out some of the cylinders at slow speed so that the amount of fuel to be injected in the cylinders remaining in operation might be sufficient to keep the pumps working. This, however, results in vibration and rough running under idling conditions. Furthermore, the cylinders cut out become cold and if the engine is needed when landing after a long glide, these cylinders may not start firing immediately.

In the Deschamps engine the fuel pumps are provided with a valve which when closed stops the fuel delivery from one of the cylinders of the double pump, thus cutting one injection out of two.

Instead of having a fuel injection at each power stroke, one is made every two strokes of the piston. The result is, that the power impulses still follow each other in the same order, no vibration is set up and all the cylinders are kept firing, remaining warm and ready to immediately deliver maximum power.

Lubrication

Pressure lubrication (80 to 100 lbs.) is provided throughout, except on the fork rods.

Two oil pressure pumps and two oil scavenging pumps, each built in a single unit, are used. Provision has been made to keep the pumps in operation in the steepest climb or glide, the oil being pumped from both ends of the crankcase.

A small scavenging pump is located in each overhead camshaft cover which forms an oil pump, and to avoid too many feed lines and connections, these pumps deliver the oil to a main line which connects the large scavenging pumps to the tank.

Camshafts are hollow and kept filled with oil under pressure; through small holes drilled in the side of the cams, all points of contact are sprayed.

Most two-cycle engines using ports for exhaust experience excessive consumption of lubricating oil which is lost through the ports and causes excessive smoke. This defect was eliminated by providing a vacuum pump, a system of canalizations, and small grooves cut a little under the exhaust ports. Oil is thus drawn out from around the piston before it can reach the ports and be lost. A certain amount of oil is allowed to travel past and pass over the bridges between the ports at the same time providing adequate lubrication for the top of the piston and cylinder walls. It is easy to adjust the degree of vacuum and thus the amount of oil being pumped out.

For safety purposes, all outside oil lines are eliminated and all important oil tubings inside the engine are welded together and inserted in the castings of the crankcase and the rear accessories section.

Oil strainers and oil pumps can be removed from the engine by unscrewing a cap or a few nuts, without being obliged to remove any oil connections.

Supercharger Drive

On the rear of the crankshaft a Lanchester type torsional vibration damper has been incorporated for the protection of the gear drives. This damper is combined with a torque limitator, a kind of a clutch where the tension on the friction linings is such as to allow the coupling to slip momentarily when there is a sudden increase of the torque due to abrupt acceleration or deceleration of the engine speed.

The driven member of the torque limitator ends in a tubular shaft splined at the end for driving the central gear. This gear is not mounted on the tubular shaft itself, but has a shank supported in two bearings (roller and ball), the latter also taking the thrust.

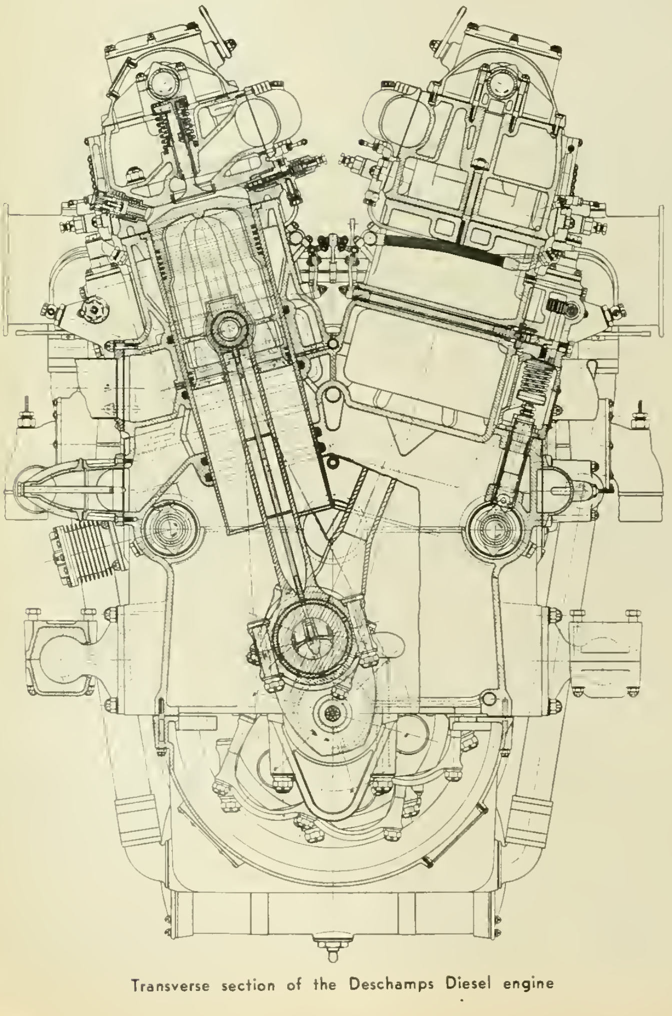
In the center of the gear a driver is splined to the tubular shaft driving the central gear through 8 coil springs under tension, the whole thus forming an elastic coupling.

The central gear drives a vertical shaft with a speed double that of the crankshaft; this shaft in turn drives a horizontal shaft, from which all accessories are driven. The horizontal shaft, using bevel gears with Gleason spiral teeth, turns at the same speed as the vertical one, and is driven by means of miter gears.

In order to make the engine reversible, water pumps, oil pumps and superchargers automatically run in the same direction, regardless of the sense of rotation of the crankshaft.

On the horizontal shaft two miter gears mesh with the gear on the lower part of the vertical shaft. These two gears are not keyed to the horizontal shaft, but are mounted on ball bearings, and drive the shaft by means of roller clutches, one locking when turning to the right and the clutch in the other gear when turning to the left.

When the engine is running, one of the miter gears becomes locked on the horizontal shaft through its roller clutch, whereas the other gear is "free wheeling" in the opposite direction at double speed (with respect to the shaft) or at 6400 r.p.m. for 1600 r.p.m. of the engine. This fairly high speed is not harmful as in that condition this gear does not transmit any load.



Transverse section of the Deschamps Diesel engine

The use of roller clutches in the supercharger drives allows the supercharger drives to over-run the engine.

Due to its high compression, a Diesel engine stops almost immediately when the fuel is shut off. With the engine running at 1600 r.p.m., the supercharger impellers are driven at 21,600 r.p.m., and although these parts and the drive gears are fairly light, their inertia might very well cause destruction if a careless operator closed the throttle too suddenly.

Superchargers

The superchargers, or centrifugal compressors, were designed by Dr. Moss of the General Electric Co.

A small portion of the air entering the compressors is taken from the crankcase; baffles and other precautions keep oil from being drawn out of the crankcase. This has been done to create a certain amount of ventilation for the crankcase. Fresh air enters the crankcase through breathers in the front, and the air thus circulates through the whole length of the crankcase, cooling the bearings and the pistons and carrying off fumes and fuel vapors which might have passed by the piston rings. Any unburnt fuel would run back in the cylinder head and be burned on the following combustion unless expelled through the exhaust ports.

Starting

At the rear end of the left hand cylinder head casting, a compressed air distributor is mounted, driven from the overhead camshaft. This distributor directs the air to the cylinders of the left hand cylinder bank only and in the order of firing. Each cylinder has an automatic valve for the entrance of the starting air.

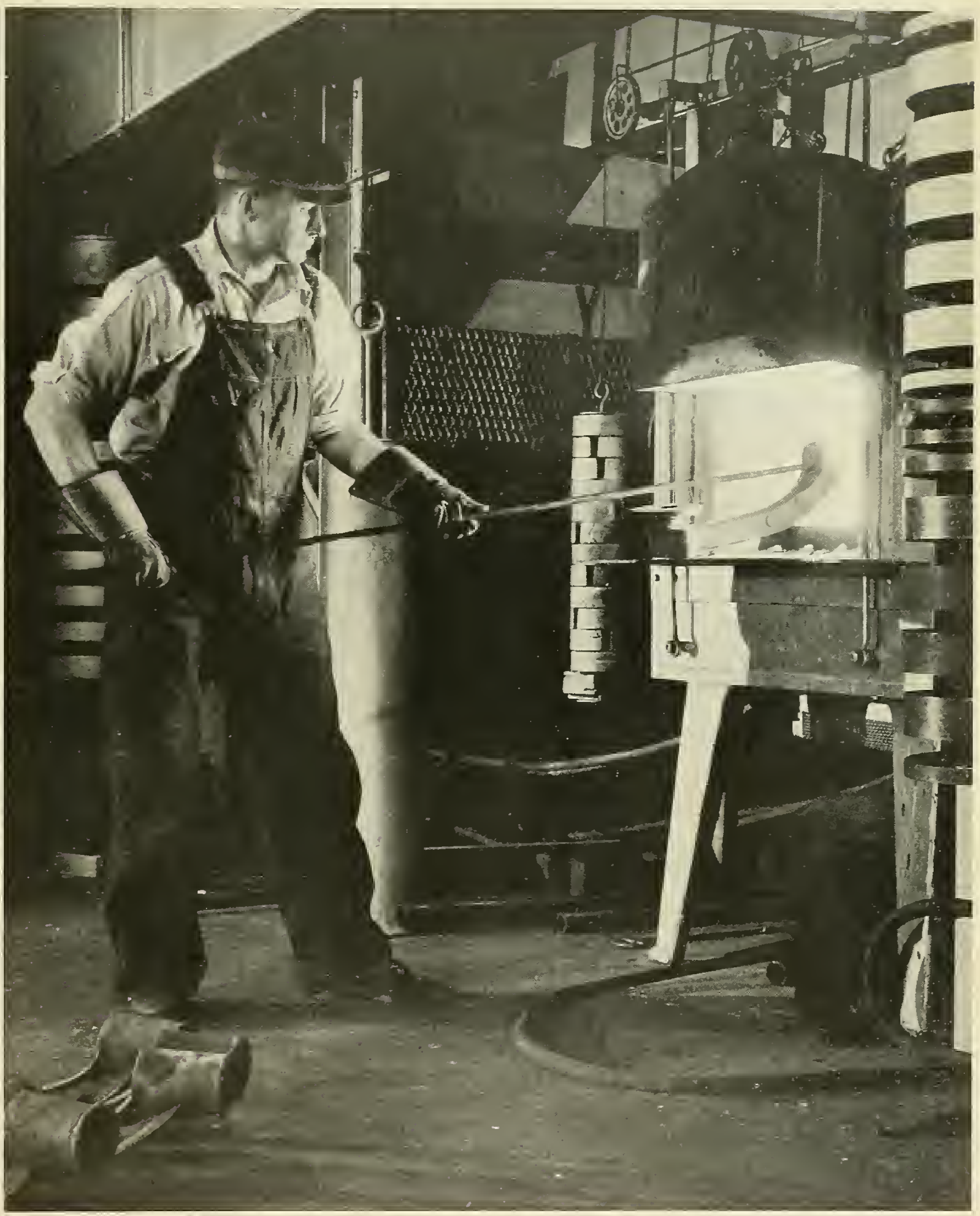
The compressed air distributor is double, for starting the engine in either direction, but there is only a single air line from the distributor to each cylinder. For reversing the rotation of the engine, the operator turns a two-way cock before opening the central starting valve.

A small two-stage Heywood compressor restores the pressure in the air tank after each start, and an automatic relief valve cuts out the supply once the air tank is filled to capacity.

The compressed air turns over the engine at 120 r.p.m. without removing the compression but greater cranking speed can be obtained by decompressing the left hand cylinders and starting the engine on the right hand cylinders.

Glow plugs have been provided for in the right hand cylinders, to be used in very cold weather if needed, but under normal conditions, the engine starts without them.

• STRENGTH FOR THE SKY



Into the heat treating rooms goes metal for Boeing planes. Out it comes, double its original tensile strength! That strength, combined with skilled workmanship, explains the sturdy quality of Boeing aircraft. Boeing Airplane Company, Seattle, subsidiary of United Aircraft and Transport Corporation.

• BOEING HAS ALWAYS BUILT • TOMORROW'S AIRPLANES TODAY!

The new Fairchild Cabin "24"

● The new Fairchild Cabin "24" is a three-place ship with a coupé-like arrangement of front seats, and a fold-down rumble seat. When the ship is used for only two people, the rear seat space provides additional space for baggage.

In design the ship is somewhat similar to the previous model 24, but the cabin has been enlarged to accommodate the extra seat and several engineering features have reduced the parasitic resistance. A 300-pound increase in gross weight has been made possible without adding to the weight of the fuselage. The fuselage is entirely constructed of chrome molybdenum steel tubing and designed to fit into carefully rounded fairing of plywood bulkheads and T-shaped fairing strips. Fairing attachment clips are welded on the fuselage. Square tubing is used for longerons and some vertical members to secure greater welding strength. An arrangement of bulk-headed fairing groups (added as complete units to the top, sides and bottom) has materially improved the appearance. The full NACA cowl is provided with riveted rocker-box caps. Instead of parallel lift struts and their jury strut auxiliaries, a converging arrangement over the oleo with a unit fairing of the lift-strut tripod has done much to eliminate drag, and affords easier access to the doors.

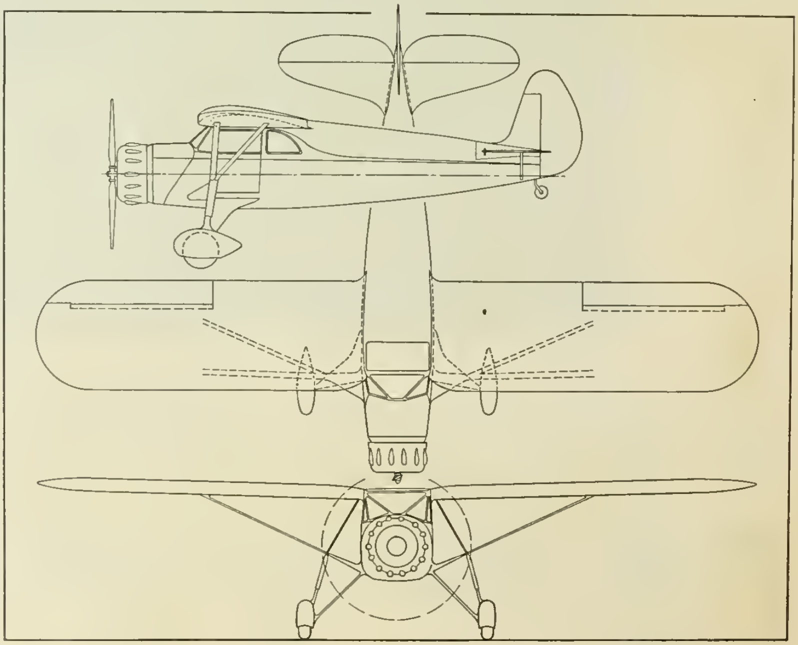
The new aileron, made of aluminum alloy with built-in leading edge bulkheads, has a slot arrangement which intensifies the air-flow when the aileron is at an upward angle. As a result, adequate control is retained even with the stick completely back and the ship in stalled position. The typical Fairchild cantilever-type fin, balanced rudder, easily adjusted stabilizer and ball-bearing-hinged elevators have been engineered into an exceptionally clean and responsive tail group. The rudder is widened and doubly reinforced at the bottom to avoid bending through rough handling on the ground.

The wing section used is the N. 22 developed by the U. S. Navy.

Wings are made up with 1.5-inch I-beam spruce spars, interconnected with a combination of dural and steel N-struts and duralumin compression members that have been anodically treated or covered with baked enamel to prevent corrosion. Drag wires .25 inch square are used and all metal fittings are cadmium plated. Lift strut fittings are of extruded 24ST alloy, anodically treated. Bolt holes in spars are dural bushed. Ailerons are attached directly to rear spars through metal brackets. All hinges throughout (32 in all) are the self-aligning, grease-sealed, ball-bearing type. Plywood leading edges and closed section aluminum alloy trailing edges prevent sagging of the wing fabric.

The exceptionally wide landing gear (9 feet 3 inches) practically eliminates ground-looping. The 8-inch oleo travel assures soft landings without bouncing. Movable parts in the gear are fitted with bronze bushings and Zerk-gun attachments. Warner brakes, with individual pedals working in conjunction with the rudder, are provided. Wheel-streamlines are built in two units, are easily removable and are internally bulkheaded to prevent mud-clogging. The safety-glass windshield is in a one-unit frame. Individual sun-shades, parking brake and windshield-wiper are standard. The seating arrangement is comfortable, with individual spring-cushioned seats, leather upholstering and chrome frames.

Forward visibility is comparable to that achieved in an automobile; such visibility has been secured by mounting the engine



Three-view outline drawings of the Warner-powered Fairchild Cabin "24" lower than in previous models and by reducing the frontal area of the cowl. The nose is below the horizon, making navigation easy. The cabin is insulated with Seapak against heat and sound. The engine has a radial arrangement of molded rubber mountings and the space between the engine and fire wall simplifies inspection and maintenance. The wing tanks, each of 20 gallons capacity, can easily be removed by unfastening bolted metal straps.

Standard equipment on the magnesium alloy instrument panel includes tachometer, oil pressure gauge, altimeter, compass, air speed indicator, oil temperature gauge, ignition switch, primer and mixture control and navigation light switches. The panel has provisions for mounting additional instruments.

The all-metal Hamilton-Standard propeller has a diameter of 91 inches.

The ship has a cruising speed of 125 m.p.h., a top speed of 145 m.p.h. A 500-mile trip may be made easily in 4 hours, and 1200 miles can be covered in less than 10 hours with one stop for fuel.

The fuel consumption of the Warner Super-Scarab is 8.5 gallons per hour; in covering 125 miles, the rate of fuel consumption is 14.7 miles per gallon, which means a cost of about 2 cents per mile of travel.

The Warner Super-Scarab is a 7-cylinder radial engine rated at 145 horsepower at 2,050 r.p.m. Its total weight, without hub or starter, is 300 pounds, equal to 2.05 lbs. per h.p. The bore is 4.625 inches and the stroke 4.25 inches, giving a total displacement of 499 cubic inches. Fuel is consumed at the rate of .55 lb. per h.p. per hour and oil at the rate of .025 lb. Two Scintilla magnetos, a Stromberg carburetor and Eclipse starter are standard equipment.

General Specifications

Wing span	36 feet 4 inches
Length	26 feet 9 inches
Height	7 feet 3 inches
Power, Warner Super-Scarab	145 h.p.
Fuel capacity	40 gallons
Oil capacity	3.5 gallons

Weights (Pounds)

Weight empty	1354
Normal gross weight	2150
Useful load	796
Baggage with 2 persons	200
Baggage with 3 persons	75
Wing loading	11.55 lbs. per square foot
Power loading	14.8 lbs. per horsepower

Areas (Square Feet)

Wing	186
Ailerons	17
Fin	4.1
Stabilizer	16
Elevators	13.8
Rudder	9.4

Performance (With full load)

High speed	145 miles per hour
Cruising speed	125 miles per hour
Landing speed	45 miles per hour
Climb at sea level	750 feet per minute
Service ceiling	20,000 feet
Cruising range	600 miles

Warner Super-Scarab-powered Fairchild "24" Cabin plane

Little Rollo Goes to Washington

(*Continued from page* 21)

Snoofty," said Rollo, soothingly. "After all, aren't Army pilots listed as expendable material?"

"Not in peace time," said Uncle Snoofty. "Only in war. Those pilots don't mind dying for the United States of America; but why should they die for Commissar Farley?"

"Come," said little Rollo, "calm yourself, Uncle Snoofty. Let us follow this procession to the Red House."

So they hurried on past the Treasury, or Kremlin, which used to be the winter palace of Czar Andrew Mellon before the revolution, when the Demo-Communists got in and shrunk Andrew from a melon to a dried crab apple and banished him to Pittsburgh, Siberia.

And what a happy sight met the eyes of little Rollo and Uncle Snoofty when they crowded onto the lawn of the Red House, for the annual egg-rolling contest was about to start. There were children and grown-ups everywhere, all demanding Relief; all of them were unemployed and most of them were unemployable. Everyone was cheering lustily, for everyone hoped to get something for nothing, like the veterans' lobby.

"Isn't this exciting!" cried little Rollo. "There hasn't been such a free-handed free-lunch government as this one since the days of ancient Rome, when the people out of work and out of the disbanded Roman Legions demanded free bread and free circuses, and got both. Now we are at the free food and free circus stage; later on we may have to pay the piper for the dance. But why bring that up? Let's get on with the egg-rolling."

A large and hungry looking lot of Democrats were assembled on the lawn; some of them hadn't eaten regularly for years. Old Uncle Snoofty, who had voted the straight Democratic ticket because he had grown tired of Hoover and Prohibition, began to feel sorry that he hadn't voted for a continuation of the old evils. Uncle Snoofty felt like sending a telegram to Hoover, saying, "Forgive me for thinking you were lousy. You weren't *so* lousy, I realize that now. And I still don't think you were good." But he recollected that it cost $1.75 to send the message to Palo Alto, so he didn't bother. That's the only reason Hoover hasn't had more telegrams recently.

But with a toot on a trumpet the egg-rolling contest started off with a loud hurrah. Sistie and Buzzie rolled a couple of eggs, and a few more children did likewise. And then, as at all Democratic affairs, the promoters ran out of supplies. All of a sudden there were no more eggs. There were the children, waiting to roll eggs, and no eggs! It was an embarrassing moment, but Commissar Farley leaped to the rescue with a basket of Air Mail operators, all Republicans dyed in the shell; so with many a happy laugh the children of Democracy proceeded to roll these Air Mail operators on the Red House lawn, just as Senator Black had been rolling them for two months past.

"It's great fun, isn't it?" cried little Rollo.

"Swell," cried Uncle Snoofty, joining in the sport. "But if a war starts, with the Army carrying air mail and the Air Mail people acting as eggs, what happens?"

"We appeal to the League of Nations," replied Rollo, with a twinkle in his eye.

. NEW EQUIPMENT and METHODS .

Radio-Range Signals Shown Visually

• A UNIT which visually interprets aural signals of aeronautical radio range beacons which are relied upon for directional guidance, has been developed by W. E. Jackson and L. M. Harding, radio engineers of the Aeronautics Branch, Department of Commerce.

This development includes an indicator which fits into the instrument panel and is similar to that devised for use with the Department's experimental radio system for blind landings and can still be used for this purpose, if desired. It has an open face with two needles, one vertical (the chief indicator) and the other horizontal. If the aircraft moves off course, the vertical needle moves accordingly in the same direction; if the plane is exactly on course, it remains in the center of the dial. The horizontal indicator shows the volume of the received signals.

In addition, a converting set which fits into a box 6 × 7 × 7 inches, is attached to the aircraft's regular radio receiver, upon which no changes are necessary. If desired, signals may be simultaneously received through the headphones, thus giving visual or aural indication.

If headphones are used, however, the pilot will hear a steady signal when on course, and a predominant dot or dash when off course, depending upon the direction, instead of the familiar Morse code A (.—) or N (—.). It is necessary to change the character of the signals transmitted in order for the visual indicator to function.

The problem of making radio range signals available in a visual form has been before the department for several years. One solution considered was the installation of visual type transmitters at radio range stations which would actuate two vibrating reeds on the instrument panels. However, this method would have been very costly for the entire airways as against less than $500 for the system just developed.

The present arrangement has undergone extensive flight tests which have shown it to be satisfactory, but as yet, no definite plans to place it in operation on the Federal airways have been made.

Cleco pneumatic engine starter

Stratosphere Air Sample Containers

• WHEN CAPT. Albert W. Stevens ascends into the stratosphere in June with Major William Kepner on a flight sponsored by the National Geographic Society, he will take with him several air-sampling containers in which he intends to get samples of air at various elevations in the stratosphere for chemical analysis by the U. S. Bureau of Standards.

The air-sampling containers, designed by General Electric lamp engineers at Nela Park, Cleveland, will, it is planned, consist of specially constructed ten-kilowatt-size lamp bulbs equipped with valves for the intake and exhaustion of the stratosphere air, and will probably also have pressure-recording gauges.

The bulbs will be evacuated, then sealed at the bi-post prongs, where the intake and exhaust valves will be located. Tubes leading to the outside of the balloon's gondola will serve for the intake of the stratosphere air into the air-sampling containers, which will be resealed after specimens have been obtained at various altitudes.

Dumore Hand Grinder

• A LIGHT-WEIGHT, high-speed hand grinder, known as model 8HG, has been introduced by the Dumore Company, Racine, Wis.

Weighing 26 ounces, it is powered with a 1/40 h.p. universal-type Dumore motor which can be used on either AC or DC current. The motor has a speed of 15,000 r.p.m. and its dynamically-balanced armature (which makes for smooth operation, long commutator brush and bearing life) is mounted in double grease-sealed-type ball bearings.

Special ⅛" capacity chuck, toggle switch, eight feet of rubber-covered cord, plug, and three grinding wheels on shanks, are standard equipment while 12 different shaped wheels are available as extra equipment.

Magnus Cleaning Products

• THE PROPER cleaning of engines during overhaul and while in service is a matter of prime importance. To allow fast, thorough and safe cleaning of engines and parts, Magnus Chemical Co., Garwood, N. J., has placed on the market an aviation cleaner which is harmless to aluminum parts, lacquer, dope, paint or other metal.

These products meet the needs and requirements of the industry for a cleaning material which is speedy in action, economical in cost and thorough in results. They are marketed with the idea that no one cleaner can best perform with maximum efficiency on all classes of work and that every particular job requires a substance which will best do the work required under the circumstances.

Another product specifically for aviation use is the Magnus airplane body cleaner, which is applied to remove oil, burnt-in exhaust carbon, stains, etc., from doped, painted or lacquered surfaces of cloth or metal. This product is non-inflammable and can be applied by a spray gun similar to the Hypressure Jenny manufactured by the Homestead Valve Manufacturing Co., of Coraopolis, Pa.

Pneumatic Aircraft Engine Starters

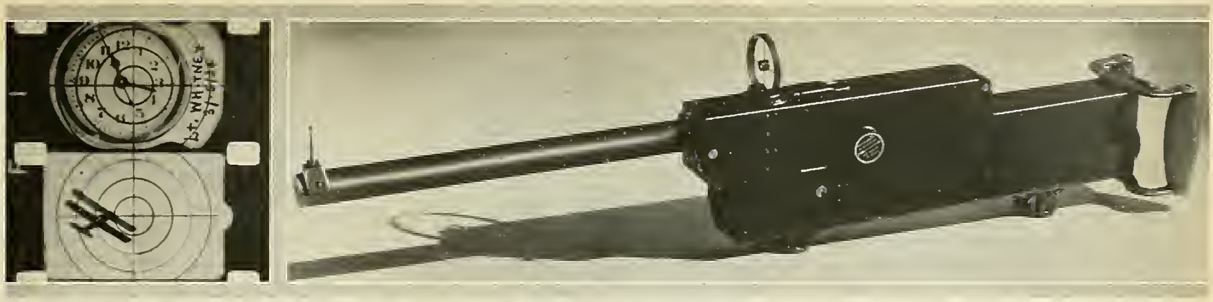
• PNEUMATIC ENGINE starters of the rotary and piston types for aircraft engines equipped with inertia starters, have been introduced by the Cleveland Pneumatic Tool Co., Cleveland, Ohio.

Both types operate with compressed air at pressures from 80 to 125 pounds, assuring ample power to wind the inertia starter at the proper speed.

Type 77 engine starter, used to replace the hand crank, has an 80 r.p.m. speed and weighs 22½ pounds. It is furnished with an adapter to fit the hand crank and can also be provided with either a twist or a snap throttle. A short connection is standard equipment, but on special order a 30" extension can be supplied.

Type 1600 engine starter weighs 12 pounds and is fitted with a bayonet lock for attaching to the inertia starter in the same manner as the high-speed electric starters. Its speed is 7500 r.p.m.

In the Cleco line of pneumatic tools for aircraft factories and service shops is a rotary polisher and grinder, a number of rotary air drills, riveting hammer for dural rivets, a riveter and various types of blow guns. In addition, the company markets pressure seated air valves, hose clamps, pneumatic hose line and other kindred accessories.



Left: Part of typical burst of "fire" made with the new Fairchild camera machine gun CG16 shown on the right

Fairchild Camera Machine-Gun CG16

• THE NEW and improved camera machine gun type CG16, just introduced by Fairchild Aerial Camera Corp., Woodside, Long Island, N.Y., features greater simplicity, economy and the possibility of allowing more realistic training than with equipment heretofore available.

To increase the value of camera gun training, the CG16 looks like, weighs as much as, and is mounted and operated like standard service machine guns.

16 mm. motion picture film contained in light-proof metal magazines which are loaded in the camera unit of the gun just as a clip of cartridges is slipped into an automatic pistol, is used. Each magazine has 25 feet of film which takes 1,000 photographs in 56 seconds of firing.

The usual rate of exposure is 16 frames per second, but a retarding device on the camera mechanism slows this down to 12 frames per second when desired.

On the bottom are mounting lugs for attaching the gun to both fixed and flexible types of machine gun mounts by the insertion of two bolts. The CG16 is designed to fit directly in either the Browning or the Colt machine gun mounts and can be fitted to any other by a simple adapter.

Camera mechanism is contained in one light, compact unit, which can easily and quickly be removed from or installed in the gun case. The camera is independent of the lens and may be placed unerringly in the correct position for operation by guides inside the gun case.

The camera unit contains most of the few moving parts of the whole camera gun and its mobility facilitates inspection and servicing. The camera case is made of aluminum, and stainless steel and bronze are used in all working parts.

A rotating disc shutter is fitted, and between the shutter and film is the glass plate with the circles and cross lines of the reticle system engraved on it.

In the back is an opening with a hinged cover through which the film magazine is inserted. The magazine can go into position only when it is inserted correctly.

On the left of the case is the winding key and the film consumption indicator gear-drive. This gear automatically engages the indicator on the outside of the gun case when the camera is slipped into the camera well; and the control lever, which also fits automatically into connection with the rod connected with the trigger. On the right is the button by which the exposure rate may be set.

Additional efficiency is achieved by a simple optical system which transmits as much light as is needed to enable the gun to be used in the early morning or late afternoon and on days when other camera guns would be impractical.

The lens has a maximum aperture of 3.0 and is fitted with an adjustable iris diaphragm. It is installed in a fixed position at the optical laboratory of the factory, to assure perfect focus and to eliminate lens adjustments in the field. The focal range is 25 feet to infinity.

The reticle is automatically photographed on the film with each image of the target and shows position of the target with respect to the path of travel of the imaginary bullet; correctness of "lead" allowed by the gunner to compensate for relative velocities of aircraft and bullets and the distance from the plane to the target at the instant of firing, providing the dimensions of the target are known.

The time-recording system which automatically registers the exact time of each burst, consists of a stop-watch and celluloid identification card for recording the essential data at the conclusion of each burst. Both are in a chamber in the front part of the camera, mounted on one removable panel. On another removable panel are lamp bulbs which eliminate the necessity for daylight illumination of the watch and data card.

Super-speed panchromatic film, allowing operations under practically all lighting conditions is used. It is packed in either light-tight metal magazines loaded and ready for insertion or on a special core without the magazine for reloading used magazines.

The U. S. Navy has adopted the Fairchild CG16 as standard equipment.

New Method for Engine Servicing

• REINFORCEMENT of Kinner and Warner engine cylinder heads through a new method developed by Air Transport Equipment, Inc., Garden City, New York, is claimed to eliminate cylinder-head breakage and provide satisfactory service over long operating periods. A reinforcing stud is screwed in through the rocker box support and the fins to the base of the cylinder head while a metal, with elongation close to that of aluminum, is used to allow equal expansion.

The company also has developed a new non-soluble rubber for push rod gaskets called Nonsal, which is available in all sizes for all aircraft engines. This rubber compound is impervious to dissolution from oil, gas, or other substances.

Top Motor Lubricant

• LUBRAA OIL Corp., Brooklyn, N. Y., is producing a top motor lubricant, called Luvohl, which is for eliminating the hard carbon deposits usually forming as a result of using high octane gasoline.

Added to the gasoline in a ratio of 2 ounces for every 5 gallons, Luvohl is completely assimilated in the gasoline.

Through its use, the manufacturers claim decarbonization in the combustion chamber, resulting in cleaner plugs, piston heads and combustion chamber; lubrication of the intake valve stem and guide and the elimination of carbon deposits therefrom; removal of carbon from face and around exhaust valve, spark plug electrodes and from behind piston rings and constant lubrication of cylinder wall and piston rings. As a result, cooler engine operating temperature is achieved, r.p.m. and engine efficiency is increased and better compression is obtained. L. S. von der Heyden, who is well-known in aviation circles, representing the Lubraa company, reports that recent tests have shown that Luvohl eliminates squeaky valves and cuts maintenance and repair bills.

The product is packed in 1- and 5-gallon cans, and in 15- 30- and 55-gallon drums, and a new can is being developed to dispense pints and quarts.

Three New Light Pobjoy Engines

● The experience gained from the world-wide operation of Pobjoy engines in a variety of aircraft types has enabled Pobjoy Airmotors, Ltd., of Cheshire, England, to produce three new 7-cylinder radial engines suitable for aircraft ranging from inexpensive private planes to the smaller luxury airliners. These new low-horsepower engines, offering novel and advanced designs, feature low-weight per horsepower, little or no vibration in action and economy in operation and maintenance.

Nicholas-Beazley Airplane Co. of Marshall, Mo., are the representatives in the United States for Pobjoy engines.

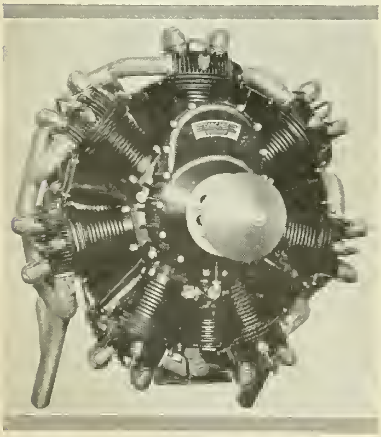
The three models comprise the 90 h.p. "Niagara," geared .47 to 1; the 80 h.p. "Cataract," geared .47 to 1; and the 70 h.p. "Cascade," direct drive, each weighing with propeller hub and cylinder deflectors, but without exhaust collectors or cowling, 145, 135 and 126 lbs., respectively. The powers indicated are the maximum outputs; powers at normal r.p.m. are 84, 75 and 65 respectively, while maximum power weight ratios are (lbs. h.p.) 1.61, 1.71 and 1.80.

Engines Have Same Displacement

All three engines have the same bore and stroke (77 mm. times 87 mm.), the swept volume being 2,835 litres. The different power outputs are obtained by virtue of the normal speeds, which are respectively 3,200, 2,900 and 2,600 r.p.m.

The 90 h.p. Niagara, the first radial provided as an essential feature with complete cowling, has an overall diameter of 26.5 in.

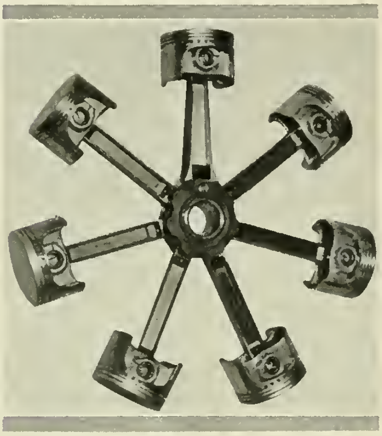
The 80 h.p. Cataract generally resembles the 1933 "R" engine, but has a redesigned ignition system, improved cylinders, reduction gear, thrust and exhaust collectors. It is intended for light planes whose first cost is one of their most important factors. Overall diameter is 26 in.



70 h.p. direct drive "Cascade"

The 70 h.p. Cascade is a direct-drive version of the Cataract, the omission of the reduction gear permitting a further reduction in price at the sacrifice of 10 h.p. Its overall diameter is 26 in.

The cowling on the Niagara, weighing 10 lbs., consists of a chromium-plated nose-piece supported on a tubular ring stayed rigidly from the crankcase. The rear edge of this nose-piece is threaded with a leather thong, to provide a non-rattling support for the hood.



Pobjoy piston rod assembly

Between the cylinders are deflector plates supported from flat plates anchored to the tubular ring.

Tops of the finned cylinder heads are covered by cast helmets, made detachable for manufacturing convenience. Gaps between the front of the helmets and the cowling ring are bridged by sheet metal extensions screwed to the heads and lined with felt to prevent rattle. Air entering the nose-piece is thus forced to circulate over the cylinder heads or around the barrels, and the passages are so shaped that air speeds therein are higher than that of the aircraft, resulting in cylinder temperatures lower than with an uncowled engine.

The inner grid is shaped so as to force a portion of the air behind the gear case, thereby equalizing the temperatures of the upper and lower cylinders.

Exhaust collectors weighing 6 lbs. are situated inside the outer hood. To minimize fire risk, a sheet aluminum guard completely surrounds the rear of the engine, shielding it from the exhaust pipes. This shield forms a natural extension of the cylinder head fairing; the exhaust collectors thus run between the shield and the outer hood. By suitable holes in the wall of the main air tunnel provision is made for a proportion of the cooling air to be driven over the collectors, sufficient to maintain them at safe temperatures. In a serious crash, the exhaust pipes would be trapped between two layers of cold aluminum.

Engine accessibility is not impaired by the presence of the cowling. After lifting the hood, access can be gained to the spark plugs, valve gear, magnetos, cylinder base nuts, oil filters, fuel pump and other accessories without disturbing the cowling.

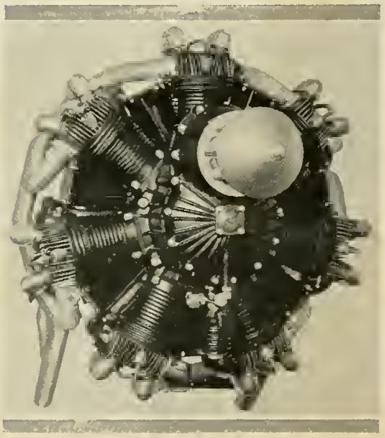
Before removing a cylinder, the exhaust collector and inter-cylinder deflectors must be detached, but the nose-piece may be undisturbed. The cylinder may then be removed after unscrewing four base nuts and slackening the induction pipe nut.

Valve Gear is Accessible

The valve gear is enclosed in oil-tight cast aluminum casings. Access to the tappet-adjusting gear is gained by removal of two cast and machined rocker covers on the top of the cylinder head. They are outside the cowling, and the latter is therefore not disturbed. Covers are held in position by a V-shaped spring secured by a self-locking thumb screw.

To remove a pushrod it is unnecessary to disturb the casing surrounding it. This casing is oval in section; depression of the valve by the fingers permits the pushrod to be moved rearward and withdrawn upwards.

The crankcase is formed around its circumference with an oil-tight chamber



80 h.p. geared "Cataract"

enveloping the tappet guides. The triangulated pushrod casings (which are anchored to the cylinder and withdrawn with it) socket into the cover of this chamber through rubber-lined expansion joints. Oil working out of the tappet guides is trapped in this chamber and drains back into the crankcase at its lowest point.

Details of the valve gear have been designed to avoid lost motion and wear, and partial compensation for cylinder expansion is provided by the location of the forged steel rocker bracket at the base of the cylinder head.

Valve gear wear and lost motion have been so reduced that the valve covers need not be removed for inspection more frequently than every 125 hours.

Contact Breaker Magneto

A special four-pole stationary contact-breaker magneto has been produced. Having to run at only ⅞ crankshaft speed, the duty on the contact-breakers couplings and armature bearings is so reduced as to eliminate trouble with these components.

Magnetos are entirely grounded and the engine is supplied fully shielded for use with radio. Spark plugs require inspection only every 250 hours.

Separate distributors are fitted and include improvements which eliminate the possibility of internal tracking. One distributor is fitted with a trailing segment for connection to a trembler coil or hand magneto, providing finger-tip starting in conjunction with hand-turning gear built into the engine and operated by cable from the pilot's seat. This system renders it unnecessary to touch the propeller for starting.

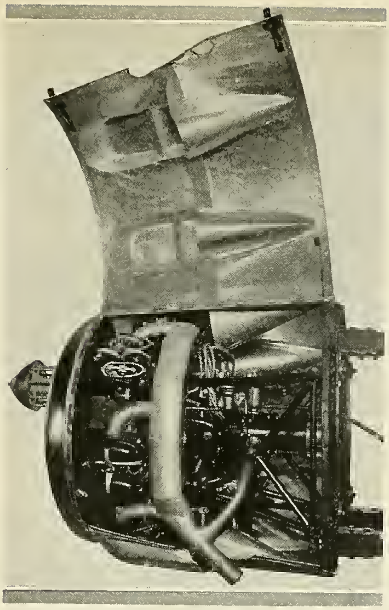
Induction passages are cast integral with the rear portion of the crankcase, and radiate from a common center which is warmed by an exhaust-heated hot-spot. Short tubes with rubber expansion joints connect the crankcase with the cylinder heads.

All induction pipes are the same length, insuring uniformity of mixture strength. As a result, the specific fuel consumption when cruising is .52 pint b.h.p. hour, which, at the usual cruising power of 70% rated h.p., gives the figure of only 3.85 gallons per hour. Oil consumption at cruising speed averages only one pint per hour.

Mixture Enrichment

The mixture is enriched to .60 pint just at full throttle by a power jet operated by a cam on the throttle lever.

To avoid freezing, the carbureter has formed in it a passage around the throttle chamber, through which hot scavenge oil circulates.



Installation of the Pobjoy "Niagara"

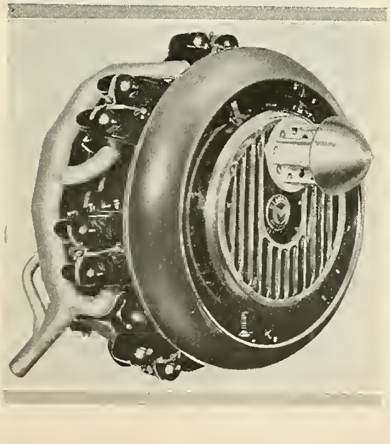
In addition, there is a controllable hot-and-cold air intake, the mouths of which lie inside the space formed between the lower cylinder cowling and the hood. This space contains comparatively dead air, and when flying in dust-storms the likelihood of sand being sucked into the air intake is reduced.

The die-cast aluminum cylinder heads are generously finned, and are screwed to the steel barrels by a process which has been in use for eight years without a leak.

Valve seatings are inserted into the head by a procedure which eliminates the three conditions which tend to loosen valve seats, namely: unequal expansion, erosion by hot gases, and the hammering effect of the valve impacts.

The reduction gear is of the double-helical type and includes a shock absorber to eliminate rattle at low speeds. The large gear floats axially, but the propeller shaft drum is detachable and has hardened driving dogs, thus eliminating wear at this point.

90 h.p. geared "Niagara"



The fuel pump drive is carried on the port side of the rear cover and is automatically lubricated from the crankcase.

A pair of spindles emerging to the rear and running at ¼ crankshaft speed are provided for driving the tachometer and a mechanical windshield wiper, if required.

On the starboard side of the rear cover is a Veeder type counting indicator, sealed by the makers, which records (up to 1,000) the approximate number of hours the engine has been run.

Service-tested Units

The crankshaft and its bearings, pistons, cam drive gear, oil-pump, etc., are retained as in previous engines. These components have a record of seven years' service without a failure.

Front and rear crankcase covers are of magnesium alloy, but the two half crankcases are of heat-treated, high-tensile aluminum alloy.

Exhaust collectors are reinforced at all corners with internal fillets, and are protected against corrosion by "aluminization."

The two oil-pump unions and the pressure gauge attachment are connected by steel pipes to unions on the rear cover. These pipes are carried in supports permitting their free expansion. By this arrangement provision of flexible pipes to the tank is simplified.

A nickel-chrome steel master rod integral with the big-end ring is employed. The inside of the big-end ring is hardened, as also is the crankpin, while a bronze bushing floats between the ring and crankpin.

The centrifugal-filter-flywheel assures the durability of the big-end bearing and the reduction gears.

Master and articulated connecting rods are machined from nickel-chrome steel forgings and polished all over.

A 60-watt 12-volt electric generator can be mounted on the rear end of the engine and driven through a flexible coupling from an extension of the crankshaft. This drive can be arranged for starting autogiro rotors.

Inspection and Overhaul

The engine may be run at least 250 hours between top overhauls and the new-type valve gear requires inspection only once during that period. Complete overhaul is desirable only after 500-hour intervals and the makers claim that after the first 500 hours the wear is so slight that this period may be safely increased.

PRIVATE FLYING and CLUB NEWS

Michigan Air Tour Planned

JOINTLY SPONSORED by the Michigan Air Tour Association and the Aviation Committee of the State Department, American Legion, the 1934 Michigan Air Tour, covering the Upper and Lower Peninsulas, is expected to get under way July 22 for a seven day trip ending July 28.

The plan revives the yearly air tour abandoned in 1933 when a series of week-end sportsman tours was substituted for the single mass excursion. Due to the large number of cities in the state which have new airports as a result of CWA aid, new interest in aviation has prompted the revival of the tour, especially to these cities, some of which heretofore never have had any aviation activity.

At least two stops each day will be made, but this plan may be changed to include a single stop each day at which time an all-day meet would be staged. A pathfinder tour is scheduled to make a survey of the route.

Pilots' Association Active

CONSIDERABLE INTEREST has been shown in plans of the Jackson, Mich., Pilots' Association for the coming summer when the public will be invited to visit Reynolds Field where motion pictures will be shown and an inspection of the facilities will be available. In addition, an air meet is to be scheduled for June.

The association, under the presidency of D. H. Gerhard, was formed last year as a non-profit organization to promote general interest in aviation in the community. Several local meets were staged, some of them stressing the safety of flying. These demonstrations were conducted by using public address systems to describe the various maneuvers as they were executed while in addition, well-known aeronautical men spoke to the public on aviation topics.

As a result of the unusual amount of local activity at the airport, and local interest in aviation, Reynolds Field, the municipal airport, has been improved with runways widened, an administration building erected and the field leveled.

32 Planes in Cruise

THIRTY-TWO PLANES, carrying 68 persons made the third annual cruise from Roosevelt Field, Mineola, L. I., to Atlantic City where they were greeted by Louis St. John, president of the local Chamber of Commerce, and others.

An inspection of the city, a luncheon and other activities were indulged in by the fliers who then returned to the airport for the return trip to Roosevelt Field. Due to advanced publicity, the largest gathering of the season assembled at the field to witness the flying activity of the air tourists.

BROCK PRESENTED WITH AVIATION AWARD

THE 1933 Aviation Achievement Award of the Kansas City Chamber of Commerce, given for the greatest contribution to the advancement of aeronautics by any one individual, was presented to Dr. John D. Brock, local flier and director of the chamber's aeronautics committee. Dr. Brock is continuing his daily flying program well into the fifth consecutive year.

Capital Area Trophy to Be Awarded

THE RESIDENT of the Capital area who has contributed most to the advancement of aviation will receive citation through the award of the Washington Air Derby Association trophy, provided by funds donated by District residents interested in aviation. The present award will be for achievement during 1933 and will be made to a person living within the District or within 20 miles of the Capital.

According to C. H. Warrington, president of the association, the trophy can be awarded for improvement of aircraft or aircraft engines, betterment of flying conditions, improvements of instruction methods, handling of airport traffic, for saving of life through use of an airplane or flying maximum number of hours without danger to life or property.

Trophy for Washington flier

Iowa Names Air Commissioners

RULES AND regulations for carrying out its new duties of regulating flying in Iowa were adopted at the initial meeting of the Iowa Aeronautics Commission, following state senate approval of a list of members submitted by Governor Clyde L. Herring. The commission consists of Charles W. Gatschet, chairman; Brig. Gen. Charles H. Grahl, secretary, Lieut. Col. W. A. Bevan, technical advisor and Ralph W. Cram and W. B. Swaney, members.

The duties of the commission include regulation of flying activity in the state, providing assistance and advice in the promotion of aeronuatics and in getting unlicensed ships in condition for license. One of its first rules prohibits the flying of unlicensed aircraft in the state after June 11.

Cooperation with the Department of Commerce in the regulation of flying and promotion of safety in aviation are among the aims of the commission.

Southee Named S. S. A. Manager

ANOTHER FORWARD step in the progress of the Soaring Society of America is marked in the announcment of the appointment of Earl R. Southee as general manager on a full-time basis.

Southee is now in Elmira, N. Y., where he is maintaining headquarters to prepare for the Fifth Annual Soaring Contest scheduled for June 23-July 9. He is well known in aviation circles, having been actively connected with the industry since the war period.

The second annual national soaring camp opens the first of this month for an extended run till June 23, the date of the opening of the Soaring Contest. The camp, at Elmira, is being conducted to provide training in soaring with a course for beginners, advanced pilots and instruction in gliding, soaring, meteorology and allied subjects available.

Groups owning equipment will have special rates while the Soaring Society of America, which is sponsoring the project, is making efforts to lower costs so as to make the camp available to the greatest possible number.

40 Planes Expected in Tour

ENTRANCE OF at least 40 airplanes in the proposed Oklahoma air tour late this summer has been assured, according to Moss Patterson, president of the Oklahoma Aviation Club.

A general outline of the route to be covered is now being made and it is hoped to map the course so that the planes will visit all of the projects completed under the Civil Works Administration airport program, along with those improved under the program and also older airports.

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NEWS OF THE SCHOOLS

Shop at Boeing School Enlarged

EXPANSION OF the radio and communications shop at the Boeing School of Aeronautics, Oakland, Calif., to double its original size was made recently. Experimental work with short wave transmitters has been authorized by the Federal Radio Commission and call letters assigned to the department of which Charles Moser is in charge.

Tests to determine the changes which occur in different grades of oils under practical operating conditions in aircraft engines have been conducted in the school's fuel and lubrication laboratory and as a result, some valuable data has been obtained and a method of running tests, which allows a quick check on the quality of any lubricating oil, was developed.

Spartan Gives Blind Flight Course

SPARTAN SCHOOL of Aeronautics, Tulsa, Oklahoma, is offering a special radio and instrument flight course available for all pilots.

A low-wing Spartan airplane has been equipped with all necessary instruments and radio used in instrument and radio beam flying and the Department of Commerce radio beam station near the Tulsa Municipal Airport, makes practicable the use of the radio beam in teaching the proper method of following the beam, locating and landing on the airport. In addition each student must complete all maneuvers of regular flight under the same conditions as if he were flying "blind" in fog or other weather conditions making visibility impossible. The last two hours of the course are flown across country for 160 miles.

Dallas School Adds Space

INCREASES IN enrollment over previous years has necessitated the construction of another dormitory for the Dallas Aviation School, Dallas, Tex., providing accommodations for more than 60 students.

Further expansion has come in the purchase of Hangar No. 5 at Love Field, thus giving the school four large hangars for its operations.

Ryan School Busy

CROSS-COUNTRY flights by students at the Ryan School of Aeronautics included two over-night trips with San Francisco and the Boulder Dam at Las Vegas as destinations. An additional all-day flight with four transport students included stops at Imperial Valley airports and lunch at Palm Springs.

The school has just purchased a new de luxe Great Lakes plane with Cirrus engine for training purposes and has recalled Milton E. Middleton to act as assistant in the maintenance department. In addition, Elwood Fraser has been added to the school's organization to direct student athletic and recreational activities.

AERONAUTICAL COURSE MOST POPULAR

AN AVIATION unit has been formed at Tri-State College, Angola, Indiana, and aeronautical engineering has become the major engineering course at the college, enrollment being greater than in any other course at the 50-year-old institution.

Aero Club Formed at Roanoke College

STUDENTS OF Roanoke College, Salem, Va., have founded the Roanoke College Aeronautical Club to stimulate aviation on the campus, to further the study of aeronautics and to foster aviation in the state.

Its officers include H. P. Grim, Jr., president; N. G. Carper, vice-president and R. S. Pechin, secretary-treasurer. Dr. R. Carpenter, registrar of the college and technical advisor of the club, is an authority on navigation and meteorology.

Diesel Engine Instruction Offered

WARREN AERONAUTICAL School, Los Angeles, Calif., is giving a thorough instruction course on the Packard Diesel engine as part of its Aviation Mechanics course. A model of the Packard Diesel which held the world's record for a non-refueling endurance flight, is available for instruction purposes.

The mechanics course offers every phase of aircraft and aircraft engine instruction and lays particular stress on the efficiency and operating advantages of the various types now in use.

Wiggins Enrolls Students

AN UNUSUALLY large number of new students have been enrolled for flying courses at the Metropolitan Airport and the Rhode Island State Airport bases operated by E. W. Wiggins Airways. In addition, more than a dozen others have enrolled in one month at the Wiggins school at Norwood, Mass.

According to G. Bancroft Hall, chief pilot at the Norwood School, present indications point to further increased enrollment in the very near future. At present instruction is provided in all types of aircraft.

E. W. Wiggins is one of the largest operators in New England and besides his bases at Norwood and Hillsgrove, R. I., he also had a base at the Fitchburg-Leominster Airport.

Boeing Graduates Class

GRADUATION EXERCISES were held at the Boeing School of Aeronautics assembly room at the Oakland Airport, Oakland, Calif., for a class of sixteen students. M. G. Lickteig, in charge of the Railway Express Agency in the Oakland district, the featured speaker chose air express as his topic and traced the development of the business from its earliest stages to the present. He predicted that airliners carrying nothing but express would soon be a reality.

Safair Opens City Offices

SAFAIR FLYING SCHOOL, Roosevelt Field, Mineola, N. Y., has opened a New York City office at 29 West 57th Street to provide information to those interested in its flying school, charter service, aerial advertising and other activities. Officials plan to introduce flying as a hobby, an idea suggested by a number of business men who are taking flying instruction on week-ends or after business hours.

The company has also inaugurated a popular priced flying course which provides all instruction required to teach a person to solo, and while this course does not qualify the student for a pilot's license, it is believed it will satisfy the desire of many pupils to learn to fly who cannot afford to enroll for a more expensive course at this time.

Gillespie Back With Roosevelt School

PAUL E. GILLESPIE has resumed his position as director of Roosevelt Aviation School, Mineola, N. Y., a position he held from 1930 to 1931, when he resigned to go with the Department of Commerce. For the past few years, Gillespie has been connected with American Airways.

Free Lecture Course Given

A free course of nine lectures on the elementary principles of aviation has been offered by the Aereco Flying Service, in its ground school at Ft. Wayne, Ind. The lectures, given in the classrooms of the Aereco service at the Municipal airport, under a trained member of the flying service, form a good basis for contacting students interested in continuing with a full training course.

New School Opens

ANOTHER INSTITUTION has been added to the fast-growing list of aeronautical training centers with the establishment of a school by the Indiana Air Service at Rochester, Ind. R. A. Van Devere, manager, has been engaged by the city to construct an airport there and will maintain a school and service station just as soon as the port is opened.

RADIO & INSTRUMENT FLYING

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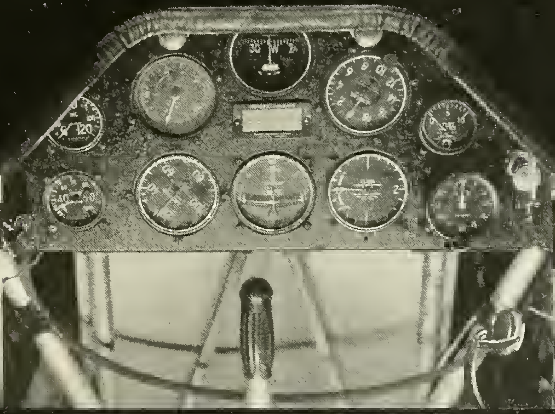

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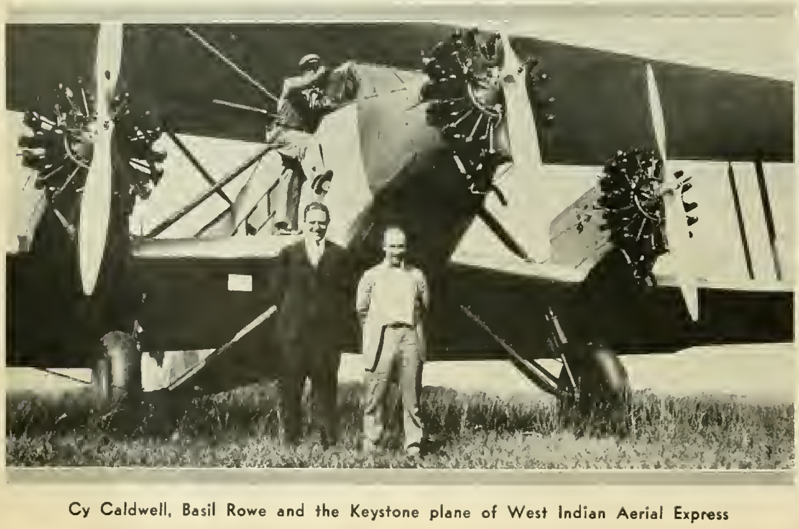
Personairlities

Cy Caldwell

● FOR SOME obscure reason that escapes me, there has developed a sudden interest in the career of one Basil L. Rowe, an old bullfighter from the West Indies. Several of the boys have written in asking me to write up Basil, who back in 1927 was chief pilot of the West Indian Aerial Express, with which I also was briefly connected at that time, flying between Cuba and Porto Rico, with stops in Haiti and Santo Domingo. It was in Santo Domingo that the famous bull-fighting period in the bold Basil's life began, and precipitately ended with the startled and frantic flight of Basil, who left Santo Domingo just a few jumps ahead of an infuriated crowd. It appears that the innocent Basil, whose previous acquaintance with bulls had not been extensive, was induced to invest in a bull-fighting promotion by a slick gent who knew more about throwing the bull than he did about fighting the creature.

Well, sir, they got an arena, bought a large and fed-up looking bunch of bulls, and hired some local worthies to battle with these snorting and somewhat smelly monsters. The fatal day for the bull-fight dawned, hot and ominous; a large expectant crowd assembled, and the cry went forth, "Bring on the bulls!" Well, they brought them on, or rather they shoved them on, for the bulls seemed strangely diffident about appearing before such a multitude. Each bull had three or four earnest peons behind it, pushing frantically; and in this peculiar manner the toros were slid forcefully into the arena, one after another. And as one after another refused to do battle with the local toreadors and matadors and cuspidors, they were slid out again, amid the loud and picturesque curses of the crowd. It seems that these bulls were not exactly bulls, but bullocks, the bovine equivalent of a capon. There was no fight left in them. And it was all very, very sad.

A toreador would approach and poke a bullock; the bullock would merely moo piteously, grunt disgustedly and move on away from there. Instead of the toros chasing the toreadors, the toreadors had to chase the toros, which was a reversal that the crowd could not tolerate. "Death to the Gringo!" they began shouting, looking ominously at the unfortunate Basil, who was actually learning about bulls for the first time. It suddenly dawned upon him that flying was safer than bull-fighting. He had an airplane, an old Waco, parked on a field near by. And I am happy to say that in getting to it he was well ahead of the bulk of the crowd. The OX-5 started at the first turn of the propeller, or Basil today might not be Senior Pilot of Pan American Airways at Miami; he might be passed on, roughly and uncouthly, in sections.



Cy Caldwell, Basil Rowe and the Keystone plane of West Indian Aerial Express

Basil Rowe is one of the most amiable and cheerful pilots I have ever met. It is impossible to disturb or annoy him; he is as quiet as a bullock. He was born at Shandaken, N. Y., on Feb. 10, 1896, and started in aviation in 1915. He is now completely bald, a state that he blames on the bulls of Santo Domingo. He grew up in the Catskill Mountains, where the only things that flew were the birds and one lone pilot named Charley Tompkins, who soon cracked up, leaving the birds in sole possession. Basil joined this one-man aerial circus, helped to glue the machine together, and spent the next two years as mechanic with Tompkins and the Moore Brothers.

In July, 1917, the call to arms found Rowe leaping to the defense of his native land, at Rich and Weaver Fields. He took part in several battles (over crap games) and learned a lot about flying that he hadn't suspected, including a prolonged course in the digging of latrines, in which he was assisted by many a now famous pilot. In time he got them all dug, completed his flying course, and by March, 1919, was ready to start barnstorming through the U. S. The Rowe Fliers became well known, and if they missed any towns it was only because there was no place to land.

By September, 1926, the cream of passenger-hopping had begun to curdle, and rides were offered at $2.50, with few takers. So Rowe flew to the West Indies with another pilot named Bill Wade, and with two OX-5 Wacos. Bill and Basil barnstormed Cuba, Haiti, Santo Domingo and Porto Rico, interested a group of sugar cane growers and exporters in the idea of an airline for the islands, and thus laid the groundwork for the West Indian Aerial Express. This was the real beginning of airline transportation in the West Indies, and the foreign air mail. It was the only airline in the world that could operate airplanes on an ox-cart schedule, though in Alaska there was one that competed with dog-teams. The chief idea was to have a line in operation when the day for an air mail line from the United States would dawn. This line then became part of the Pan American System. Basil Rowe, Bill Wade, and myself were the pilots on that first airline down there. In August, 1928, Basil was taken over by Pan-Am. along with the other liabilities of the old company, and spent three years as Chief Pilot of the Marine Division. When this division was consolidated with the land division, his position reverted to Senior Pilot.

Back in 1923 Basil held the distinction of being a partner of Clarence Chamberlin, who leaped into fame when he flew Charlie Levine and a ham sandwich to Germany, and leaped again when he became an airline critic for the Senate Committee investigating air mail. The Chamberlin-Rowe Co. at Hasbrouck Heights specialized in the rebuilding and sale of surplus Army and Navy aircraft. One of their achievements was grooming the Black Ace, the Honorable Colonel Hubert F. Julian, for the Most Stupendous Heroic Achievement of the Colored Race: the New York to Africa Flight. Colonel Julian styled himself the Aeronautical Minister to His Majesty Haile Selassi I, Lord King of Kings of Ethiopia, Conquering Lion of Judah, and Emperor of Abyssinia. They fitted out a Boeing seaplane to the Colonel's specifications; and amid a great send-off from his countrymen, the brave Colonel took off from North Beach, New York, and landed at North Beach, New York, a few seconds later. He was upside down and about one-half mile farther from Africa than when he started!

* * *

● JOHN FITKALO, who is going along as mechanic on the Recognition Trade Flight from New York to Moscow this summer, is also a Transport Pilot. If Bill Alexander, Chief Pilot, and Bill Brooks, Co-pilot, fall asleep during the monotony they will encounter crossing a lot of perfectly flat water in the Atlantic Ocean, John Fitkalo will be able to take over the controls. And when they get to Russia, he'll be able to talk to the inhabitants without making signs and helplessly waving his hands, for he speaks Russian and is also interpreter of the Flight.

John, who became an American citizen on Dec. 18, 1924, was born in Vienna, Austria, just seven days before Christmas in the year 1895. That was a bad year for the Fitkalo family. In addition to John, Mr. Fitkalo got for Christmas a box of 5-pfenning cigars, a yellow tie with green dots, two handkerchiefs with the wrong initial in the corner, and a pair of suspenders—he wore a belt, so even the suspenders were a liability.

John Fitkalo

Well, all the relatives came around and looked little John over, and wondered what to do with him. He's a very nice, quiet chap to this day, and as an infant he had an especially angelic look, so the more religious members of the family said, "Why not make him into a priest?" It happened that Mr. Fitkalo was a deeply religious man and the idea appealed to him; so from infancy John was destined for the priesthood. He never quite took to the idea, but he was an obedient son, so he let them pack him off to a theological seminary. But at the age of 16 he suddenly decided that he was not cut out for the ministry, so he just walked out of school and kept on going for three months, wandering around Austria thinking things over. The upshot was that he returned home, told his father that the Church would be better off without him, and that he'd like to become a machinist, if nobody objected. Nobody did, so he became an apprentice in his father's machine shop, and in six months got a license as a journeyman mechanic. He had a natural liking for machinery and had found the work he liked best to do.

In 1911 he came to America, worked for New York and Queens County R. R. as a mechanic for three years, worked for the Pierce-Arrow Company, and then went into business in Buffalo in 1918. He learned to fly with the late Ray Barlow in 1922, has owned four Wacos, and would sooner fly than do anything else. He is a quiet, studious, friendly chap, solid and dependable, and an excellent mechanic. If I were flying across an ocean—which God forbid, for I'm an old and feeble man—I'd want no better mechanic than John Fitkalo. But how his parents ever came to the conclusion that he'd make a good priest is something that I cannot understand, until I recall that my own family thought that I should become a banker, and urged me to enter that dubious profession. I can imagine no situation more ridiculous than that of me, as a banker, confessing to John, as a priest. It's an ironical comment on parents' judgment of their children, isn't it?

● COMMANDER CHARLES E. Rosendahl, Commanding U. S. Naval Air Station, Lakehurst, N. J., was born in Chicago, May 15, 1892, received his primary education in the schools of Kansas and Texas, and then was given that high polish to be acquired only in the U. S. Naval Academy, from which he was graduated in 1914. For seven years thereafter he plowed the briny deep, as the saying goes. During the war to make the world easier financially for debtor nations he served in ocean escort duty on cruisers and destroyers, from 1921 to 1923 he taught in the Dept. of Electrical Engineering and Physics at the Naval Academy, and in April, 1923, answered the Navy's call for volunteers for airship duty, reporting at Lakehurst.

This move stamps Mr. Rosendahl as a very brave and adventurous man, able to take his place beside steeplejacks, the very earliest airplane pilots, lion tamers, wing-walkers, and those courageous souls who wash the windows of New York skyscrapers. At that time he knew nothing about airships; and neither did the Navy. So they started even. And what they went through together in the persistent pursuit of airship experience, happy and unhappy, would make your hair curl—unless you're like Basil Rowe, and haven't any hair.

At Lakehurst, back in April, 1923, the then Lieut. Rosendahl found the small group of officers and enlisted men who still remained alive in our lighter-than-air service after our tragic and appalling losses in the ZR-2, a vague imitation of a real Zeppelin built by a group of earnest but unfortunately inexperienced men in England, and purchased by our own even more inexperienced Navy, which was so eager to own a large dirigible that it bought one from a nation that had never built a successful one, and still hasn't.

Commander Rosendahl

The first flights on the ZR-2 had been carried out in June, 1921, revealing defects in rudders, elevators, and controls; on a second flight a few days later further defects were discovered; and on a third flight several structural weaknesses were discovered in the girders. On the fourth

(*Continued on page* 80)

THE AIR SERVICES

Dresel to Command Sunnyvale

WITH A view of utilizing the past experiences of officers qualified as lighter-than-air naval aviators, the Bureau of Navigation of the U. S. Navy has issued change of duty orders to some of the outstanding officers in this branch of the service. All orders are effective June 1, 1934.

Commander Alger H. Dresel, now commanding officer of the U.S.S. *Macon,* will be ordered to duty in command of the Naval Air Station at Sunnyvale, Calif., in which capacity his experience as an airship commander not only will be available but also will make for entire cooperation between the commanding officer of the *Macon* and the commanding officer of the station.

Lieut. Comdr. C. E. Rosendahl will be detached from sea duty to command the Naval Air Station at Lakehurst, N. J., where he will be in charge of the lighter-than-air training of the Navy.

Lieut. Comdr. J. L. Kenworth has been ordered to duty as executive officer of the *Macon* while Lieut. Comdr. Herbert V. Wiley has been assigned as commanding officer of the same ship.

Other changes ordered will place Lieut. Comdr. Bernard F. Jenkins in the position of executive officer of the Sunnyvale base and Lieut. Comdr. Francis W. Rheichelderfer as meteorological officer at the Lakehurst base.

Fort Lewis for Air Base

FLIGHT UNITS will be ordered to Fort Lewis, in the Puget Sound region, where infantry and artillery are now based. The first unit to arrive will be Flight A, 86th Observation Squadron, while concentration of other flying units together with construction of new hangars, service shops and addition of material is expected in the near future by nearby Tacoma, Wash., business men.

Standley Praises Navy Fliers

RESULTS OF participation of naval aircraft in tactical exercises carried out in the Pacific in January was particularly gratifying to all who are interested in aviation and in the national defense of the United States, according to Admiral William H. Standley, chief of Naval Operations, who reported that approximately 80 per cent of the aircraft operating strength of the Fleet was engaged in the exercises and their assigned tasks calling for more than a thousand flights within two days were completed without a single actual casualty.

Naval officers were particularly impressed with the precision and accuracy with which scouting missions were carried out and with the work of the *Macon* which was engaged in these maneuvers.

LOS ANGELES SAVED FROM SCRAP HEAP

DEFINITE ASSURANCE that the *Los Angeles*, condemned by the Navy Department as unairworthy some time ago, will not be scrapped has been given by the Bureau of Aeronautics which has decided to use the veteran airship as a testing ship on which experiments and improvements could be tried and stresses and strains studied. The ship, however, will not be flown.

Army Planes Expected at Jubilee

PARTICIPATION OF regular U. S. Army Air Corps and Maryland National Guard planes in the joint celebration of Maryland's Tercentenary and the Maryland Yacht Club's silver jubilee to be held August 10 to 12 inclusive in Baltimore, is expected following receipt of promises to send aircraft for the event. A delegation of New York private planes also is expected.

Maxwell Field Contracts Let

CONSTRUCTION WORK at the Army flying field at Montgomery, Ala., is now under way following award of construction contracts for improvements of Maxwell Field. John T. Mapel, Barksdale Field, Louisiana, has the contract for the installation of night lighting equipment, while 25 field and company officers quarters will be built by Rogers & Loventhal of Chattanooga, Tenn. Both contracts entail a $305,578 expenditure.

Squadron of Curtiss Condor Bombers engaging in formation flight

Committee Studies Air Corps

A SPECIAL committee of 11 civilian and military numbers, headed by former Secretary of War Newton D. Baker is presently engrossed in a study of the Army Air Corps.

Before getting under way in its task, Secretary of War Dern advised the members that their mission is a technical one and not political. They were told to inquire into the needs which would make the Air Corps second to none and to determine whether equipment is the best obtainable and whether it is suited to our requirements; whether the Air Corps has sufficient personnel and whether the training of that personnel is adequate and thorough enough to meet every demand that may be made of it in time of war; whether Army pilots are properly equipped in instrument, blind and night flying and whether the Army gets the benefit of new improvements in aviation.

Associated with Chairman Baker on the committee are Maj. Gen. H. A. Drum, Maj. Gen. G. S. Simonds, Maj. Gen. B. D. Foulois, Brig. Gen. C. E. Kilbourne, Brig. Gen. J. W. Gulik, Dr. K. T. Compton, Dr. G. W. Lewis, Clarence Chamberlin, Maj. J. H. Doolittle and E. S. Gorrell.

Anacostia Gets New C. O.

COMDR. A. E. MONTGOMERY, now on duty in the Office of Naval Operations, Washington, D. C., will become the commanding officer of the Naval Air Station in Anacostia, Md., in June relieving Comdr. William K. Harrill now temporarily in command. Comdr. Montgomery has been serving in the Office of Naval Operations since June last in which capacity his assignment deals with the movements of service aircraft.

Felts Field Hangar Opened

ELABORATE CEREMONIES featured the opening of the new $103,000 military hangar at Felts Field, Spokane, with Governor C. D. Martin making the dedicatory speech.

Maj. R. G. Breene, commander of the 116th Observation Squadron had charge of the services, and was assisted by the aviation committee of the local Chamber of Commerce. Officers of the squadron were detailed as chairmen of various committees.

Army Learns Blind Flying

COURSES IN blind flying have been inaugurated at Salt Lake City, western division of the Army Air Corps air mail unit, with Lieut. Col. H. H. Arnold, zone commander, in charge, and Capt. W. T. Larson supervising instruction.

Training planes are equipped with hooded cockpits and carry an instructor in the rear cockpit.

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FLYING was once *all* theory. No plane had ever gone up.

But since then aviation has graduated. It is equipped with an army of facts. It has for its operating standard the precision of clockwork.

These facts and this standard of performance form the foundation for all of aviation's *future* development. If the student-flyers and mechanics of tomorrow do not learn their foundation thoroughly at the start, while they are in training, they will perhaps not do so later. Certainly their chances will never be as good again.

That is why Boeing training was planned to include the *most complete ground school courses in America*. United Air Lines, Inc., a world-famed organization, makes it possible for young men to learn flying and learn it right.

Ask any airmail pilot or Boeing School graduate to tell you about the training standards here. Meantime, send for the illustrated Bulletin giving enrollment requirements, living advantages on the airport, the variety of courses and their costs. The coupon is for your convenience. ***Next Regular Enrollment, July 2.***

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AIRLINES and AIR TRAVEL

New Air Mail Bids Opened

FORTY-FIVE BIDS, covering 17 routes were submitted to the Post Office Department for contracts under a temporary basis to carry the air mail. Rates as low as 17½ cents a mile, as against the 41 to 45 cent limit stipulated by the Department were bid in, but as yet no bids were accepted, and the possibility exists that all will be thrown out and new ones called for in conformity with legislation drawn to meet President Roosevelt's wishes.

The private bidders for mail contracts included eight companies which had been reorganized as a condition precedent to receipt of new awards. These included TWA, Inc., for Transcontinental & Western Air, Inc.; General Air Lines, Inc., for Western Air Express; Eastern Air Lines for Eastern Air Transport; American Air Lines for American Airways; Alfred Frank for National Parks Airways; Pennsylvania Air Line and Transport for Pennsylvania Air Lines and Northwest Air Lines, Inc., for Northwest Airways. United Air Lines, Inc., submitted bids for routes formerly operated by National Air Transport, Boeing Air Transport, Pacific Air Transport and Varney Air Lines.

Meanwhile the House Post Office Committee gave approval of a new measure calling for one year contracts pending the formulation of an air policy by a special commission. If this bill is passed before air mail contracts are awarded under the temporary three months basis, the bids submitted will be dropped and new tenders asked.

American Air Lines, Inc., bid on eight routes and in seven cases had competition, but was sole bidder on the Boston-Newark route. In no case where the company had competition was it the low bidder. TWA, Inc., bid 24 cents an airplane mile on the Newark-Los Angeles route against American Air Lines' 39½ cents per mile.

Some new names appeared during the opening of the bids, notably Syra Aviation Corp., Pacific Seaboard Air Lines, National Air Line Taxi System and Central Air Lines, Inc.

The lowest bidder for a contract was Pacific Seaboard Airlines at 17½ cents for the Chicago-New Orleans route.

STATISTICS REVEAL AIR TRAVEL SAFETY

ON THE basis of 1933 performance by the commercial airlines, a passenger could make a transcontinental trip by air every day for 25 years, more than 9,000 coast-to-coast flights, before anticipating a fatal accident, according to statistics compiled by Transcontinental & Western Air. Last year's safety record was the best the airlines have ever established and reflects the rapid development in flying and the numerous safety devices developed to make aerial transport as safe as possible.

United Makes Traffic Record

UNITED AIR LINES completed a successful year in 1933 carrying 127,693 revenue passengers and flying 14,714,415 miles, both figures representing an increase over comparable figures in 1933. These increases were 44 and 12 per cent respectively.

Air express amounted to approximately 500,000 pounds, an increase of 175 per cent, while air mail totaled 3,182,165 pounds, a decrease of 154,203 pounds. Ninety-five per cent of the 1,250,000 miles of flying scheduled monthly were completed, enabling the company to maintain its position as the leader in the number of passengers carried and mileage flown.

Sleeper-Condor Ready

A CURTISS CONDOR, equipped with 12 full-sized sleeping berths, is soon to go into service over the Dallas-Fort Worth-Los Angeles section of American Airways' route.

This plane, the first all-sleeping plane, is powered by two 735 h.p. Wright Cyclone engines equipped with controllable pitch propellers, full N. A. C. A. cowling and nacelles which extend beyond and fair into the trailing edge of the lower wing.

In the new Condor, the cabin measures 19 × 6½ × 6¼ feet. It is divided with transverse partitions into three compartments, each containing two sections of two berths, making a total of 12. During the day, provision is made for four persons in each compartment.

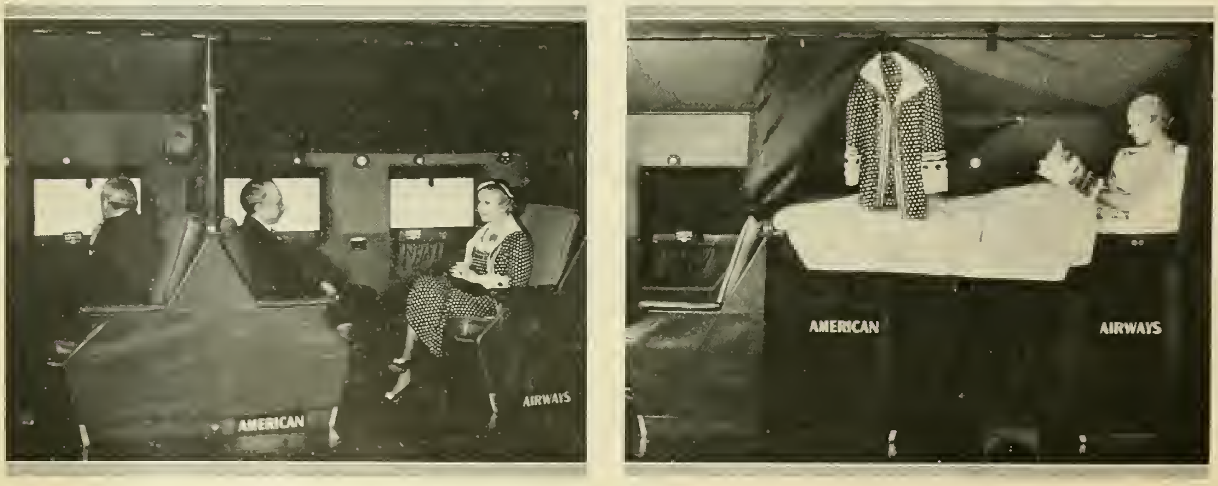
At night, berths are made ready, either on the ground or while the plane is in flight, quickly and conveniently by simple devices which allow changing one section of two seats into one section of two berths in about four minutes. Berths, both upper and lower, are 28 inches wide and an inch longer than standard railroad sleepers. Provision is made for luggage shelves, hammocks, clothes hangers, individual lights, call bell and individually controlled ventilators and heaters. Both berths have windows and are equipped with spring and mattress and safety belts.

The new Condor shows a top speed of 190 miles an hour and a cruising speed of 160 miles an hour.

Arkansas Traffic Increases

ACCORDING TO Elmo Coon, city traffic manager for American Airways in Little Rock, Ark., there was a 39 per cent increase in passengers out of that city over his company's lines during 1933. Shipments of mail and express for the year more than doubled those of 1932.

(Continued on following page)



Interior of new Curtiss Condor sleeper-plane, showing arrangement of seats and berths

Passengers, Express Increase

WHILE CANCELLATION of air mail contracts has resulted in a reduction of some phases of air transport activity to the level of several years ago, the number of passengers carried and the amount of express were apparently unaffected, at least during the early stages of the cancellation order. However, the general effect, felt severely in March, was to slow up the tempo of American air transport.

For January and February passenger traffic and express poundage were ahead of 1933 figures. Miles flown in February totaled 3,127,726, the lowest since 1931; mail poundage is down to February, 1929, levels at 450,659 pounds, while miles of routes in operation, cities served and frequency of schedules between cities have been curtailed drastically on some lines and less so on others.

To offset this service curtailment, airlines have made strenuous efforts to cultivate passenger and express business with encouraging results. February, one of the most inactive months of the year, saw 33,435 passengers carried—more than any similar month in previous years. Air express poundage in February was greater, at 158,358 pounds, than that of any month in 1932 and exceeded the increasing volume of the first four months of last year by a generous margin.

Miles scheduled and flown during January and February were 7,589,231 and 6,754,940 respectively. Passengers totaled 66,336; air express was 332,481 pounds and mail carried was 1,130,571. Gasoline and oil consumption was less than the similar period in 1933 with 3,389,448 and 99,045 gallons used respectively, compared to 3,707,299 and 105,779.

Radio Unit Installed

AN AIRWAYS teletype and remote control station is being installed in the administration building of the Springfield, Mo., municipal airport. The equipment will be connected with the Department of Commerce airways radio range station, located a mile south of the port.

TWA Operating Fast Service

HIGH-SPEED airline service between Pittsburgh and New York with the new Douglas airliner was inaugurated by Transcontinental & Western Air on an hour and 45 minute schedule offering one round-trip daily, except Sunday.

No increase in fares for the faster service has been instituted, but the new plane is providing a service which is about twice as fast as with the older equipment. Planes leave Pittsburgh at 3:30 p.m. and arrive in New York at 5:15 p. m. The return plane leaves New York at 6:30 p. m. and arrives at the Allegheny County Airport in Pittsburgh at 8:30 p. m. An average of about 190 miles an hour is maintained for the flight.

UNITED AIR LINES OBSERVES EIGHTH ANNIVERSARY

ITS EIGHTH anniversary of operations and the eighth birthday of domestic air mail service under private operators was observed by United Air Lines on April 6. This company's Pacific Northwest division inaugurated the initial privately operated air mail scheduled in 1926 over the Elko-Pasco route on April 6 of that year.

Western Union in Express Hook-up

A NATION-WIDE hook-up with Western Union telegraph offices as depositories of air and air-rail shipments, as well as for special messenger pick-up and delivery service, has been negotiated by the Air Express Division of the Railway Express Agency for its affiliated companies.

Under the arrangement, packages will be received at Western Union telegraph offices. A telephone call will bring a messenger to provide special pick-up service, supplementing that already maintained by the Railway agency. The new service has been adopted to facilitate and expedite air and air-rail express service to all states in the country.

Tampa-New Orleans Line Planned

GULF AIRWAYS, Inc., has been organized to establish an airline between Tampa and New Orleans on a tri-weekly basis with stops at Panama City, Pensacola and Mobile. Operations will be conducted from the new Davis Islands municipal airport and service will be extended in the future to include a second line from Miami to Atlanta, via Tampa and Tallahasse. Passengers and express will be carried on both routes and, when possible, bids will be submitted for the transportation of air mail.

Officers include Jerome A. Waterman, president; Earl Lines, vice-president, and Lewis Petteway, secretary.

Meals Ordered by Radio

BEFORE ARRIVAL at passenger terminals, air travelers on the coast-to-coast service operated by Transcontinental & Western Air, Inc., are provided with printed menus from which they can select their meals. The orders are placed by the plane's two-way radiophone and upon arrival, the passenger finds his hot dinner or luncheon awaiting him at the airline terminal.

The new service replaces the former practice of serving meals aboard the planes in flight and permits a greater variety in food. However, the practice of serving meals in flight will be made easier and more elaborate meals will be possible when the fleet of Douglas airliners is placed in service this summer. The Douglas is equipped with buffet and service cabinet from which complete meals may be served in flight.

Thos. Cook Operates Air Bureau

COMPLETE AND accurate information, schedules and fares on all air services and facilities for reservations and delivery of airline tickets, is included in the Air Travel Department operated by Thos. Cook & Son, New York, N. Y., under the direction of Maurice H. Delauney.

Special schedules, showing all air and air-rail connections and prices to and from Mexico City have been prepared for ready reference of passengers interested in Mexico, but other schedules are prepared and itineraries planned for air trips to any point in the United States or Latin America.

New Airline Planned

YOUNGSTOWN AIR Transport, Inc., has been formed to operate a Columbus-Akron-Youngstown passenger line using Lockheed Vega equipment.

For the present the line will only operate when there are sufficient passengers, but regularly scheduled service is expected to go into operation soon. Paul Jones is president of the company, while Norman Wise is chief pilot.

Bowen Extends Service

BOWEN AIR LINES has extended its airline from Tulsa to St. Louis after discontinuance of the Tulsa-St. Louis service operated by Braniff Airways. Bowen planes had been operating only as far north as Tulsa on a line extending from San Antonio and Houston.

Temple Bowen is president of the airline company.

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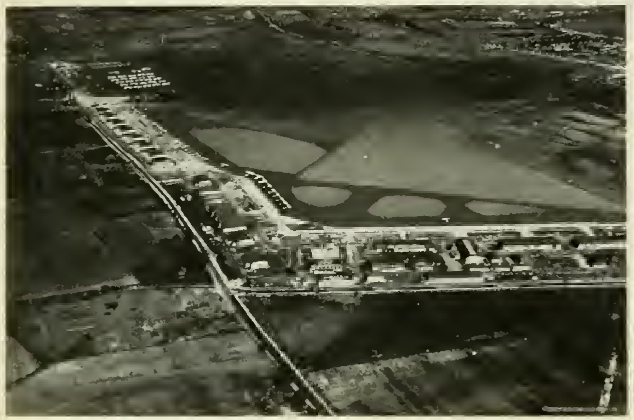

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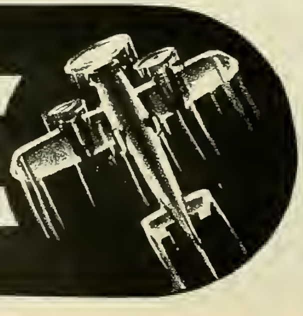
For information address Operations Manager

ROOSEVELT FIELD



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LOCATION: Most conveniently accessible by air from other metropolitan airports and Northeastern U. S. Situated well away from water, swamps and industrial smoke, the meteorological conditions are the best in the area.

SAFETY: Greatest possible flying safety with three airports, twelve golf courses and open country all within a three mile radius, absence of congested building areas, water and swamps. Emergency landings are safe.

FACILITIES: Fifty buildings, 350,000 sq. ft. hangar space of which 131,000 is in new concrete and steel hangars, complete night lighting, two famous all-way fields with 1,800,000 sq. ft. paved runways, taxiways and aprons.

LOW COST: Rental from .28c per sq. ft. per year up, according to buildings, which is most reasonable considering facilities and convenience to world's largest city and America's densest flying area.

ACTIVITY: There are more airplanes in the Metropolitan area of New York than in any other similar district and more than twice as many at Roosevelt Field than at any other metropolitan airport.

PROMINENCE: The most famous and widely known aeronautical address in the world, it has long dominated as the commercial aviation center of the East. This is a valuable asset to your aeronautical business.

SALES OUTLET: Proximity to the greatest buying power in the World. Learn what other operators are accomplishing in this great market.

* Convenience to New York City *

Express train service provides shortest and most dependable transportation to center of Manhattan. Over 80 trains per day, some taking only 32 minutes, ply between Pennsylvania station, New York City and Mineola, the Field station. Excellent motor roads including the new Northern and Southern State Parkways and a private parkway for uninterrupted motor service to the Airport.

REMEMBER THIS

Your

AVIATION SUCCESS DEPENDS *on a thorough* TRAINING!

IMPORTANT!

All mechanical instruction is now given at Roosevelt Field. The School in New York City has been discontinued and training is now offered during the days only. However, the equivalent of our former night courses is available on week-ends. Thus if you work during the day you can still obtain the famous Roosevelt training.

From the date of his enrollment the student is given individual attention and supervision.

If you are planning a career in Aviation, you must have a thorough training to assure yourself of the success that should be yours in this fast growing industry.

The Roosevelt Aviation School, an established institution of world-wide prominence, with complete equipment for instruction in all Flight and Mechanics Courses, can give you the proper training in whatever branch you select.

Whether you wish to learn to fly for either Sport or a professional career, or if you desire mechanical training, you can get the best by placing yourself under the guidance of Roosevelt experts.

THE TUITIONS ARE REASONABLY PRICED

The Flying School carries the Highest Government Rating, has its own separate training field, uses Fleets exclusively for primary training, proper types of planes for advanced instruction, provides expert maintenance on all equipment and employs only Rated Ground and Flying Instructors.

The courses offered are: Amateur, Private, Limited Commercial and Transport—Ground and Flying.

The Mechanics School is located in separate instruction shops at the Field. Here expert instructors and ample up-to-date equipment make it possible for you to learn without your having had previous technical training. The courses offered are a Regular Mechanics Course of five months and a one-year Master Mechanics Course.

If you enroll with Roosevelt you have, in addition to the excellent instruction, the advantage of training at a really active airport where there is something doing every minute.

Roosevelt graduates are holding responsible positions in factories and airports in this and foreign countries. They know the importance of a thorough training. That is why they recommend Roosevelt.

In each phase of instruction the student is given the opportunity to display his talent on real repair and overhaul problems.

If you can, visit us at Roosevelt Field for full information. If not, then 'phone Garden City 8000, or write Registrar, care of the School, Mineola, New York. Kindly state age and preference of course.

ROOSEVELT AVIATION SCHOOL

Airport Conducts $1,500,000 Business Annually

THE FACILITIES AND ACTIVITIES OF FIXED BASE OPERATORS AT ROOSEVELT FIELD

●

GEORGE W. ORR
President, Roosevelt Field, Inc.

● As aviation emerged from the early stages of the barnstorming days and settled down to the serious business of making a name for itself in the commercial archives of this country, more attention became focused on the airport—home and haven of the airplane.

For many years the airport was considered a place where aircraft landed and took off; where gas and oil were available and where, on occasion, minor adjustments to engine and plane could be made. As aviation grew, the airport faded into comparative oblivion when compared to the attention that was being focused on the airplane. Public thought centered on what the airplane could do, never recalling that these same airplanes needed some place for shelter and some area over which embryo pilots could be taught the rudiments of flight.

Then, the CWA appropriated $10,000,000 for airport development in the United States and announced plans for a nation-wide system of airports which would not only provide employment for thousands of men, but would also give aviation an added impetus. As airports began springing up in all sections of the country, the public again became conscious of the fact that these fields were as necessary to the airplane as a harbor is to a steamer. However, their conception of an airport hardly measured up to the realization that these sites in many instances were cities in themselves and that many thousands of dollars changed hands in business transactions thereon.

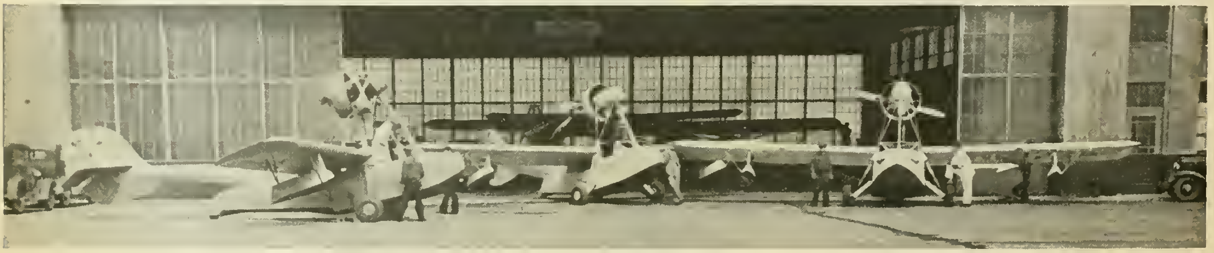
Airport hotel lounge-room

One of the finest examples of an airport of this type is Roosevelt Field, at Mineola, N. Y., where the commercial possibilities of all important airports of tomorrow are revealed to the fullest extent. Because of its historic fame, its convenience to a large metropolitan area, and its vision in constructing and maintaining excellent facilities for the flier, this field is an outstanding example of an airport as a veritable hive of commercial activity.

Beside individual plane owners, many of whom make their livelihood in aviation activity, there are some 44 recognized businesses on the airport, furnishing every service needed by the flier. Here is a field which is probably used more regularly and called upon for service by more fliers than any other airport.

An idea of the possibilities offered on a field of this size might be gleaned from the fact that in 1933 alone more than $1,500,000 in business was transacted. More than 350 people are employed in various capacities, while thousands of pilots, passengers and executives of the aviation industry have visited there.

All the varied activities on the field are directly connected with and depend upon aviation or those who fly. There is the operation of the airport itself, presenting the diversified activities of administering a small city and a large business in one. With some 50 buildings, the roofs, doors, plumbing, water, sewerage, gas and electric supplies require the constant atten-



Line-up of three amphibions manufactured by Amphibions, Inc., at Roosevelt Field tion of a crew of workmen as do the several miles of service roads, pavements, drainage, 200,000 square yards of paved runways and aprons and 500 acres of sodded landing surface.

Flying traffic must be controlled and the public cared for. The usual staff of a large business, with sales, publicity, credit and accounting departments complete the airport operating personnel.

Then there are the activities of flying and the necessity of ministering to the needs of the flier. To do this there are 14 service hangars, 12 engine repair shops, 11 airplane repair shops, 6 airplane agencies, 10 used airplane and 8 used engine brokers, 5 aerial advertising operators, 3 manufacturers, 3 aeronautical supply houses, 3 consulting engineers, 3 experimental laboratories, 2 restaurants, a modern hotel, 2 aircraft radio service stations, 3 aerial photographers, Divisional Headquarters for the Aeronautics Branch of the Department of Commerce, 2 approved flying schools, one mechanics school, one parachute sales and service station, 2 sheet metal and welding shops, an aircraft instrument laboratory, an aerial charter and sightseeing service, private hangars, a scheduled airline, a barber shop and other conveniences for the airport patrons.

Roosevelt Field is really a merger of three fields, containing in all some 500 acres. This combination includes the old Roosevelt Field known as Unit No. 1, the old Curtiss Field and a large tract of land lying between these two and designated as Unit No. 2. While known under one name, all three fields are used by aircraft, and a system of paved runways has been constructed making possible a take-off into the wind in 10 directions, the entire layout entailing some 1,800,000 square feet of paving.

While there were more buildings and space on Roosevelt Field than on any other airport, an extensive construction program was undertaken and completed, giving the airport 131,000 square feet of modern concrete and steel hangars and a new hotel and extensive restaurant facilities. These improvements brought the total number of buildings on the field to 50 and the hangar space available to about 350,000 square feet.

For night flying, there is a most complete installation including a four-million candlepower Sperry floodlight, auxiliary floodlights which are illuminated automatically if the arc floodlight fails, double-ended revolving beacon with white and green lights of three-million candlepower which are visible for more than 70 miles, thirty-million candlepower searchlight, ceiling finder and code beacon. The night field is outlined by border lights and all obstructions marked with red signals.

One hundred and fifty planes are hangared on Roosevelt Field by a host of owners, some of whom are well-known in society and sporting circles. Roger Wolfe Kahn keeps a Bellanca, Puss Moth and Compter Swift in one of the new hangars while W. C. Langley has a Bellanca and Fairchild, and Victor Emanuel has two Stinson Reliants and a Taylor Cub. Other private owners using Roosevelt Field include S. W. Pulitzer, Clyde Pangborn, Al Williams, A. C. Bostwick, Wallace Bird, the *New York Daily News* and H. Potter. Aircraft on the field include practically every commercial type manufactured in the United States with 5 autogiros, 4 amphibions and a Keystone tri-motor completing the list.

Facilities for calibrating instruments

An airport police force and a modern fire fighting truck and a crash truck, together with complete fire fighting facilities aid in keeping the field protected at all times.

To provide information to the press and public, the field management issues a regular news bulletin each week. K. S. Lindsay, operations manager and George W. Orr, president of Roosevelt Field, Inc., collaborate in preparing the information.

As a further aid to its tenants the airport management, after much effort, succeeded in having the southeastern leg of the Elizabeth, N. J., Department of Commerce radio range beam relocated so as to pass between Mitchel and Roosevelt Fields. The beam, which previously had gone out to sea off Long Island and therefore was of no use to Long Island pilots, now provides Roosevelt Field with a much-needed radio guide.

One of the interesting contributions Roosevelt Field has made to aviation is its Historical Museum. Noting how rapidly even the most common types of war-time airplanes were becoming extinct, the Field management began collecting specimens of pioneer and war period machines. Although only about two years old, the Museum has one of the most valuable and interesting aviation collections now existing, including a model 10 Bleriot and a Tom Baldwin pusher, both of a vintage of about 1911, an OX-J1 Standard, a Curtiss JN4C, commonly known as a Canuck, a Sopwith Snipe, a 504 K Avro, Nungesser's Nieuport, an Aeromarine 39 B, a model 13 Spad, and Bellanca's first cabin monoplane. There is also a very complete exhibit of engines, from early pioneer days to those in modern use. The Museum was closed last year for exhibit of its rarest pieces at the World's Fair, but will be re-opened again this spring.

Many of the country's outstanding commercial concerns either maintain headquarters or agencies at Roosevelt Field, among them the following:

Amphibions, Inc. This corporation was founded at Roosevelt Field in 1926 and has devoted its organization continuously to the development and construction of small amphibion aircraft. Its product has been outstandingly successful and popular, and its present model the Privateer P3B, a 3-place cabin amphibion, is the result of the years of experience and scientific development undertaken by the company. Bertram Work is president and O. P. Graff, vice-president and sales manager.

Air Associates, Inc. Founded in 1927, this company manufactures and distributes aviation hardware, material, accessories, supplies and shop equipment. It

Gas and oil requirements are attended to by this fleet of Roosevelt Field fuel trucks

Joe Crane's parachute servicing room

Rebuilding aircraft in Aero Trades' hangar

has a branch at Glendale, Calif., and features an annual catalog which is widely distributed to the trade for use as a buyers' guide and reference book. At present its manufacturing department is being expanded to make available to the trade many special products not before carried in stock. F. Leroy Hill is president; Haven B. Page, vice-president and H. I. Crow, secretary-treasurer.

Aero Brokerage Service of New York. Founded in 1931, this company conducts a used airplane sales service, dealing in all makes and types of aircraft. R. W. Simpson is president.

Aero Trades Co. Service specialists on all makes of aircraft and engines. Does sheet metal welding, wood-working and fabric work and holds eight classifications under an Approved Repair Station license from the Department of Commerce. The company is planning to extend its shops to accommodate new woodworking and fabric machinery and equipment. Founded in 1931 by James G. McIntosh, Ernst Schiefle and Eugene Langlois.

Aeronautical Radio Co. Manufactures the "Aeronaut" radio receiver and is local dealer and service representative for Western Electric and Westport aircraft radio receivers and transmitters. It carries in stock complete equipment and supplies to service all makes of aircraft radios and is installing new machinery and equipment which will make it one of the most completely equipped shops of its kind in the country. Included in the work it has done are installation and service jobs on Jimmy Wedell's racer and Frank Hawks' "Sky Chief." George W. McCauley is president of the company which was founded in 1933.

Aircraft Sales Co. The business was founded in 1932 as a used plane brokerage house. Frank Cordova is head of the organization.

Air Transport Equipment, Inc., was founded by Alexander A. Pedu in 1920 and carries a complete line of aircraft equipment and material including landing lights, wheels, wind cones, motor replacement parts, flying suits, helmets, etc.

Atwell Sales Co. Stinson agency in metropolitan area now planning an extensive sales campaign. Recently sold 5 Stinson Reliants to the Gulf Refining Co., and sold 6 new and 2 used Stinsons last year. George J. Atwell, Jr., is president.

Aviation Clearing Co. of Mineola, Inc. Engaged in a comprehensive brokerage service and offers charter flights and aerial photography. Is distributor for Monocoupe aircraft and Hill Aircraft Streamliners. Founded last year by Charles A. Gregson, president-secretary and Gustavo S. de Bustamante, vice-president-treasurer.

Burt Benton Model Co. Founded by Burt Benton who has been making display models since 1927. The company manufactures scale display models, wind tunnel models and is distributor for Don Coe Products, Inc., and broker for independent model makers. Benton is also a consultant engineer. Plans are under way for the opening of larger quarters to accommodate additional machinery and equipment for model work.

Waco Sales of New York, Inc., displays its stock of new planes

Joe Crane. Dealer for Irvin Air Chutes and Floyd Smith Safety Chutes and offers service and repair on all types of parachutes. Crane is one of the country's most experienced professional parachute jumpers and a competent instructor in the art.

Engine Air Service, Inc., Approved service station for Wright, Pratt & Whitney and Continental engines. It specializes in replacement of valve seats in all types of engines and is planning to enlarge its overhaul shop and install the latest type of equipment. The business was founded in 1931 by L. A. Hauft, president and W. S. Burfoot, secretary-treasurer.

Engine Brokers, founded in 1933 by Donald B. Walling and Wm. W. Wieland, conducts a sales and service business for all types of aircraft engines.

Fleetwings, Inc., specializes in the manufacture of "shot welded" stainless steel aircraft parts including ribs, wing spars, complete wings, tail surfaces, ailerons, bomb racks and gasoline tanks. It developed stainless steel for airplane parts after a number of years of research and manufacturing experience, and received from the U. S. Army Air Corps an order for test wing beams made of stainless steel. Carl de Ganahl is president; G. S. Ireland, vice-president; R. C. Bergh, vice-president and chief engineer and Fred Lench is secretary and treasurer.

General Airplane Service. Founded in 1930 by Al Billgren, this company conducts a general airplane and engine repair station.

General Hangar Service. Was organized in 1932 by Jack Conklin who conducts a repair and storage business for all types of planes and engines. Conklin installed instruments and checked planes which made a number of transoceanic flights.

General Sheet Metal & Welding Co. Specializes in all metal products and welding and in streamlining high-speed planes. The company has an approved repair station certificate and is owned by P. O. Abrams and A. C. Long who founded the business in 1930.

(Continued on following page)

HOWARD AILOR
PRESENTS

TWO NEW
WACO PLANES
AT ROOSEVELT FIELD MINEOLA, NEW YORK

1934
WACO
CABIN
AND F2

THE WACO CABIN

☆ The new Waco Cabin has more power, more speed, more room and more comfort. A new arrangement of the back seat gives more free room and a baggage compartment large enough to hold four golf bags and complimentary baggage for a week-end trip. The Waco Cabin is available with three different motors, Continental 225 H.P., Jacobs 225 H.P. and Wright 250 H.P. A new feature with the Jacobs motor is complete "Dual Battery Ignition." The improved instrument board will accommodate a radio and other desired instruments.

THE WACO F. 2

☆ The new Waco F. 2 has all the features of speed, power and comfort of the Waco Cabin and is now equipped with full N. A. C. A. cowling.

Visit Hangar 16, the Waco hangar, at Roosevelt Field and see these new planes. A descriptive booklet will be mailed on request.

Operation instruction free with the purchase of Waco planes. Charter flights, solo and instruction flying with experienced pilots, also are available. Visit the interesting display of Waco planes today.

AERONAUTICAL CHAMBER OF COMMERCE

WACO
SALES
OF NEW YORK, INC.

HANGAR 16, ROOSEVELT FIELD, MINEOLA, NEW YORK. PHONE: GARDEN CITY 5313; (NEW YORK CITY: VIGILANT 4-5317)
Also Belvedere Airport, West Palm Beach, Florida

(Continued from preceding page)

Giro Sales & Service, Inc. conducts an autogiro sales, service, cross-country and sky banner towing advertising business, pioneering in the latter and doing considerable work along these lines. Leslie B. Cooper is president and Henry Y. Satterlee is secretary-treasurer.

Parker Motor Rebuilding Co., was founded by O. C. Parker in 1920 to conduct motor service work.

Plane Owners Service rebuilds, refinishes and does top overhauls and engine checking. Officials are Howard F. Flynn, George H. Weitz and Harry Fuller.

Roosevelt Aviation School, Inc. The present corporation was founded in 1927, succeeding the Roosevelt Flying School, one of the pioneer schools of aviation. It was the first school in the East to receive government approval for all types of pilots and continues to give instruction for every class of license. Has operated a mechanics division since 1927 and gives courses leading to licenses to both airplane and engine mechanics. George W. Orr is president, W. D. Guthrie, treasurer and P. E. Gillespie, director.

Roosevelt Flying Corp. conducts aerial charter service, aerial photography and sightseeing flights. Was inaugurated in 1927 and its present officers are George W. Orr, president; W. D. Guthrie, treasurer and K. S. Lindsay, operations manager.

Safair, Inc. Started at Roosevelt Field in 1931 and in 1932 took over all operations at Valley Stream airport, including approved transport school and charter service. The company returned to Roosevelt Field in January, 1934, and is offering charter service, aerial advertising and photography, storage, sales and service in addition to operating its government approved school for transport licenses. It is making special efforts to teach flying for sport and as an avocation. O. P. Hebert is president; M. J. von der Heyde, business and sales manager; John Phillips, chief instructor and S. A. Reiss, chief commercial pilot.

Sky-Light, Inc. This company conducts a night aerial advertising business by means of an electric sign mounted on the lower wings. At present it is building up a Curtiss Fledgling equipped with an electric sign which, through a device in the cockpit, can be changed while in flight. John Phillip, John Klien and Seward Pulitzer are associated in this new enterprise, which only recently was organized.

Standard Aircraft Equipment Co. A new company specializing in sales and service for Bendix brakes, Eclipse starters, Pioneer instruments, Scintilla magnetos and Stromberg carbureters. Louis J. Bollo, head of the company has checked the instruments of most long-distance or trans-Atlantic planes which have taken off from New York.

Waco Sales of New York, Inc. Conducts a new and used ship sales and service department. Founded in 1933 by Howard Ailor, president and treasurer, this company is one of the most successful distributors of Waco equipment in the country. A. F. Murphy is assistant treasurer.

Zaharoff Aircraft Corporation of America. Founded in 1929, the company conducts experimental work of any nature and expects to construct a new monoplane amphibion with twin engines in tandem. In addition, exhaust and ventilating fans and blowers are manufactured. Basil Zaharoff is president.

SALES and SERVICE
Bendix Brakes — Pioneer Instruments
Eclipse Starters — Scintilla Magnetos
Stromberg Carburetors
STANDARD AIRCRAFT EQUIPMENT CO.
Hangar D Roosevelt Field
Garden City, L. I., New York

ENGINE BROKERS
Hangar "B"—Roosevelt Field—Mineola, N. Y.
THE FOLLOWING REBUILT ENGINES
FOR SALE OR EXCHANGE:
J6-5: 298 hours — J6-7: 300 hours — J6-9: 150 hours
These engines have been modified to the "O" type.
2 Wasp "B" engines. 675 hours each.
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DON WALLING WM. WIELAND

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Agent for Fairchild and all types of used planes.
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Safair Flying School is ideally situated and well equipped to give you the finest flight training obtainable—whether you plan to fly as Sportsman or Professional. Fully approved by U. S. Government for Amateur, Private, Limited Commercial and Transport Pilot Courses. Primary training given in the famous Curtiss Fledgling planes powered with Challenger engines—advanced instruction in other types, both open and cabin. Ground School conducted at New York University.
*You may pay as you fly—yet pay no more. Trial Lessons arranged. Send for Booklet A.
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Roosevelt Field, Mineola, N. Y. Tel.: Garden City 960
N. Y. Office: 29 West 57th St. — PLaza 3-9604

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Motor Overhauls — Sheet Metal
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For visiting pilots, air travelers and the general public.
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Reasonable Prices
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SPECIALISTS IN REBUILDING
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Radio Shielding for all types of motors.
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"The Aviation Parts and Supply House"
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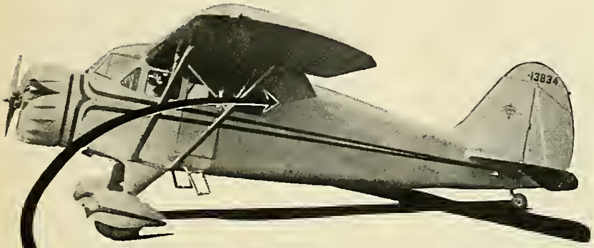
Aerial Advertising
Autogiro Sales and Service

SEE AND FLY
THE NEW
STINSON RELIANT
AT
ROOSEVELT FIELD



WITH PATENTED SPEED ARRESTERS

PRICE COMPLETE . . . READY TO FLY

$5775.00
f.o.b. Wayne, Mich.

THE 1934 "Reliant" is virtually an airliner built especially for private fliers and commercial operators. This plane possesses all the qualities that one would naturally expect of the Stinson organization. Powered with the same dependable 225 horsepower Lycoming R-680-4 Transport motor, with millions of miles of airline operation as a background and proof of its stamina and reliability.

This price includes new patented Speed Arresters, with Selective Glide and Climb. Also Scintilla magnetos, Stromberg carburetor, Eclipse electric starter (press-the-button), 13-plate storage battery, navigation lights, rubber vibration dampener on the motor. Hamilton Standard propeller, Aerol shock struts, air wheels, hydraulic brakes, streamlined swivel tail wheel. Dual adjustable controls, tool kit, NACA cowl, wheel pants or mud guards, cabin ventilators and heater. "V" transport windshield, rear vision mirror, safety glass throughout. Twelve-coat high lustre finish. all instruments — compass, air speed, tachometer, oil pressure and oil temperature gauges. Cabin appointments include: Ash receivers, glove box, vanity closure, assist cords, cabin lights, automobile type window regulators (front and rear windows), rich upholstery, floor carpets.

PERFORMANCE

High Speed	138 m.p.h.
Cruising	120 m.p.h.
Landing Run (with Arresters)	Less than 200 ft.
Rate of Climb	725 ft. per min.
Service Ceiling	14,500 ft.

These are but a few of the advantages of the 1934 Stinson Reliant. We want you to see it—and FLY IT. No obligation whatever.

GEO. ATWELL, Jr. **R. J. (Barney) BARBIN**

HANGAR C
ROOSEVELT FIELD, MINEOLA, NEW YORK

A Privateer Amphibion taxies out of the water onto the beach at Sands Point, L. I.

PRIVATEER PERFORMANCE

High Speed, 110 M.P.H.; Landing Speed, 55 M.P.H.; Cruising Range, 400 miles; Cruising Speed, 94 M.P.H.; Climb, 600 ft. per minute; Normal Fuel Consumption, 13.5 gallons per hour; Powered by 210 H.P. Continental Engine.

THE PRIVATEER AMPHIBION

costs no more to operate than a land plane and it doubles the pleasure of flying because it has twice the usefulness.

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Enquiries are invited from interested Dealers and Individuals

PRIVATEER . . THE PERSONAL PLANE

MEMO from
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To Chief Engineers:
the "Shotweld" System of Stainless Steel Construction has these advantages —

① Timing, pressure and current scientifically accurate for every job. Machine-controlled!

② The patented "Shotweld" process does not weaken the surrounding metal or weld. –

③ the "Shotweld" itself and the Stainless Steel are proof against corrosion (even in salt water).

Write for information re: ribs, wing beams and control surfaces. —

CONTRACTORS TO THE ARMY AND NAVY

FLEETWINGS INC. ROOSEVELT FIELD • • • GARDEN CITY • NEW YORK

AT THE AIRPORTS

Tampa Gets New Airport

WORK HAS been started on a tract of more than 140 acres at the southern tip of Davis Islands, Tampa, Fla., for a combination land and seaplane base. While no official statement has been made, it is understood that Pan American Airways plans to establish operations from this new port of entry.

Approximately 86 acres of the total available will be used directly for aeronautical purposes with the balance probably to be developed as a Latin-American Trade Center and Spanish-American War Memorial Park. Cost of the work, not including hangars or the installation of complete lighting equipment and other facilities is estimated at $88,000. B. W. Reeser of Pan American Airways is assisting city and state engineers in working out construction details, while Jerome A. Waterman, chairman of the local aviation commission was instrumental in bringing the project to a successful termination.

The airport will feature an administration building housing offices of commercial airlines and port authorities, three runways providing take-offs over water and a seaplane basin protected by a breakwater. Hangars will measure 140 by 140 feet while the breakwater will be 1500 by 100 feet. The runways will have 100 feet of paving flanked on each side by a 100-foot sodded strip. The longest runway (about 3300 feet) will lie NE-SW and will be crossed by a 2600-foot N-S and a 2400 E-W runway. A ramp will be available for amphibions and flying boats.

Milwaukee Airport Reopens

THE BROWN DEER airport, originally the Holterhoff Flying Service base approximately five miles from Milwaukee, Wis., has been reopened by Warren and James Stoll who recently signed a lease for the site and appointed G. E. McPherson manager.

The hangar at the field has accommodations for six planes and among the facilities available will be a complete repair and service station, gas and oil and equipment for flight training and charter hops. Weather information will be provided at least twice daily.

Historic Site for Airport

WHERE COLONEL John C. Fremont camped in pioneer days, airplanes will soon land on Mariposa County's first airport. Notice has been received at Merced, Calif., of the approval of the Mt. Bullion airport site on a plateau on the old Fremont grant several miles west of Mariposa at an altitude of 2450 feet.

It is planned to construct a field measuring 2800 by 1500 feet to serve the city of Mariposa as an airport and Merced and Yosemite as an intermediate landing field.

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88 LICENSED AIRPORTS LISTED IN MICHIGAN

ON APRIL 1, 1934 there were in the state of Michigan, 88 licensed airports, landing fields and emergency sites, according to a compilation issued by the state Board of Aeronautics, Lansing. The city of Detroit, with seven airports, has more than any other city in the state.

Wyoming Airports Under Way

A NEW airport costing $80,000 and the largest of three now being built in Wyoming is under construction at Rock Springs. Other projects under way are at Green River where $16,000 is being spent and at Farson where more than $8,000 is going into airport work.

The Farson airport will connect the Jackson Hole scenic country with the main transcontinental air line by an air route which will follow the Rock Springs - Hoback Canyon - Yellowstone National Park line.

New Operator at Ft. Wayne

INTER-CITY Flying Service has taken quarters at the Municipal Airport, Fort Wayne, Ind., where it will conduct a commercial service and flying school. Present equipment consists of a four-place Stinson monoplane, but it is planned to supplement this with a light training plane. Whitney A. Gregg is manager and Lester H. Doan, pilot.

Wabash Gets Municipal Field

THE PRIVATE airport of George Rettig at Wabash, Ind., has been taken over by the city under a five-year lease and will be operated as a municipal project. The field has been passed upon and accepted by the Public Works Administration as an approved project.

Marion Airport Improved

A $13,000 improvement program has been started on the Marion, Ill., airport under the direction of Fred C. Valentin, airport manager and Illinois Aeronautics Commission Inspector.

The work includes the addition of 70 acres to bring the total acreage available to 110; tiling, hard-surfacing four runways; construction of a boundary fence and painting posts and obstructions. A standard airport circle has been placed on the field.

CWA Program Builds 808 Ports

THE NUMBER of airports and landing fields being established by the Department of Commerce and the Civil Works Administration now totals 808 and with the approval of about 1400 additional proposed sites, local administrators are proceeding to complete the entire program as rapidly as possible.

Although the CWA aid is being brought to a conclusion, airport work is expected to continue under the sponsorship of individual states as part of the Federal government's decentralized work relief plan.

The fields now under construction, about 60 per cent of them new projects, include 391 in cities of 5,000 or more population and 417 in communities of less than 5,000. The additional projects scheduled for development are classified in two groups. The first consists of 662 leased or city-owned sites which are especially desirable as units in a nationwide network of airports. These fields, which will be given preference, include 201 at cities of 5,000 or more and 461 at municipalities of less than 5,000. The other group consists of 803 sites which have been inspected by airport engineers and found to be worth while projects.

Montana, Alabama and Florida lead all other states in the number of airports being built or improved with 71, 56 and 51 projects under construction, respectively. At least one or more airports are included in the program in each of the 48 states.

Youngstown Airport Sublet

LANSDOWNE FIELD, the Youngstown, Ohio, municipal airport has been sublet to the Art-Sam Flying Service by the Aircraft Development Bureau which leased the field from the city four years ago. T. Arthur Jones, local pilot is president of the new company and in charge of the field.

The flying service has moved two planes to the field and will centralize its activities at the site.

Price Airport Progressing

THE CARBON AIRPORT committee at Price, Utah, is completing plans for the construction of a new hangar at the site following the signing of a lease and the beginning of work on new runways. Approximately 640 acres has been set aside for airport purposes, according to J. R. Lund, airport manager.

California Airport Leased

SPROTTS AIRPORT, Maywood, California, has been leased by R. O. Penn, local flyer, who with the assistance of his daughter, Ongala Penn, will give courses in commercial flying, general aviation and operate a charter service.

• REVIEWS of BOOKS •

MARINE AIRCRAFT DESIGN

By William Munro

• A COLLECTION of data and information relating to the consideration governing the design and construction of marine aircraft, published by the Pitman Publishing Co.

This 236-page book is compiled to provide the designer and others interested in this branch of work with essential fundamental knowledge and modern and advanced practical information for constant reference.

Information, notes, diagrams (including photographs and tables) and statistics given are so presented as to be immediately available to the reader's problems in marine aircraft, as well as for the instruction of students.

Featured are 30 data sheets and insets, embodying important technical information in tabular and diagrammatic form. The sizes of aircraft discussed range from 3,000 to 20,000 pounds for flying boats and from 1,500 to 5,000 pounds for planes on floats.

ARC WELDING HANDBOOK

Lincoln Electric Co.

• AN ENLARGED 454-page edition published by the Lincoln Electric Co., Cleveland, Ohio. Profusely illustrated with photographs, drawings, and tables, this book is one of the most complete and practical treatises on the art of arc welding seen in some time.

It has been designed to present in convenient form, for ready reference, the basic information on arc welding in its present status. Its contents include not only a complete description of the arc welding process in its various forms, but also the essential data for its use in welding various types of steels, iron and nonferrous metals.

MATERIALS OF AIRCRAFT CONSTRUCTION

By F. T. Hill

• PRESENTED primarily for students of aircraft engineering, "The Materials of Aircraft Construction" is written to interest especially those concerned with aircraft design problems. The book contains references to all materials used in aircraft construction, according to F. T. Hill, the author, who is an assistant professor in the department of aeronautics at the Imperial College of Science and Technology at London, England.

References to the materials in the text are followed up by comprehensive bibliographies. Other aids to a study of the subject include a list of British standard specifications for aircraft materials and components and an index to Directorate of Technical Development specifications. A particularly helpful section is the final chapter, entitled "The Designer's Selection of Materials." Following the detailed consideration of the various materials elsewhere in the book, this chapter serves as a general summary of the preceding data and contains condensed lists of materials, their specifications and applications. Numerous illustrations and tables throughout the book clarify the text matter and present it in a concise form.

TECHNICAL AERODYNAMICS

By Prof. K. D. Wood

• THIS BOOK, published in mimeograph form by the Cornell Cooperative Society at $3.00 a copy postpaid, is an excellent compilation of data of the National Advisory Committee for Aeronautics and the Aeronautical Research Committee, and presents a critical evaluation and analysis of such data. Excellent problems are included as well as many graphs and charts: The correction of airfoil characteristics, performance computations, downwash computations, computation of longitudinal and lateral stability, range and endurance calculations, and many similar important aeronautical questions.

Written in excellent and scholarly style, this work should serve the needs of many students and young engineers.

☆ ☆ ☆

A NEW YORK PREVIEW

AT ROOSEVELT FIELD

One Ride Will Convince You . .

*LOWER INITIAL COST
*LESS MAINTENANCE COST
*MORE MILES PER GALLON

* The first of the new Fairchild Cabins is here! It revises all previous standards of cabin plane values, as no other ship in its class offers so much . . . in size . . . in performance . . . in luxury . . . in beauty . . . in safety . . . in unsurpassed *quality* . . . for such a low cost per hour. This new Fairchild has costly construction features found in no other popular make of private airplane, regardless of price. These features . . . proven and recognized . . . give this ship a longer life, a lower maintenance cost, and a definitely superior flight performance.

* We want to show this new Fairchild (as well as the spectacular Warner-powered "22") to every interested prospect. We want you to come out any day . . . learn all about it . . . ride in it . . . and see for yourself how costlier quality and unequalled economy have been combined . . . at a selling price that will surprise you.

The Warner Super-Scarab-powered "22" . . . a ship of outstanding beauty and performance. For the sportsman who wants the best in engineering, quality materials and precision manufacture. Rugged strength, flashy maneuverability and high speed combined with unusual safety and an operation cost no higher than that of the average automobile.

THE 1934 FAIRCHILD LINE IS THE HIGH SPOT
IN 10 YEARS OF BRILLIANT ACHIEVEMENT

UNITED AIR SERVICES

(GOVERNMENT APPROVED FLYING SCHOOL)

ROOSEVELT FIELD, MINEOLA, L. I. FLOYD BENNETT FIELD, BROOKLYN

THE INDUSTRY IN GENERAL

13,755 Pilots, 6,600 Planes Licensed

ACTIVE DEPARTMENT of Commerce licenses on April 1, 1934, were held by 13,755 pilots and 6,600 aircraft, which according to the Aeronautics Branch, is less than there were on April 1, 1933, when 18,457 pilots and 7,004 aircraft were licensed.

Pilots included 100 licensed in the new amateur grade, created last December. The decrease in the total number of pilot licenses is due in part to the reversion of many private and solo licenses to the student grade when the private pilot requirements were raised and the solo license was discontinued last year. This is shown by the fact that on April 1, 1933, there were 7,459 student licenses, while on the first day of April, 1934, this number had increased to 12,233. More than 1,000 solo licenses still are outstanding, but no new ones are being issued and holders are being reclassified as their solo licenses expire.

Pilots' licenses, 359 of which were issued to women, consisted of 7,047 transport, 1,020 limited commercial, 16 industrial, 4,524 private, 100 amateur and 1,048 solo pilots.

The total number of licensed and unlicensed aircraft of which the Department had record was 8,917, while this number on the same day last year was 9,086. Unlicensed craft (bearing identification numbers only) totaled 2,317.

California had 986 aircraft, licensed and unlicensed; New York was second with 846 and Illinois third with 599. Considering licensed aircraft only, California led with 836; New York followed with 760 and Illinois was third with 520.

In number of licensed pilots, California had 2,596; New York was second with 1,324 and Illinois third with 866.

The number of gliders on record was 591 of which 46 were licensed and 545 unlicensed. Licensed glider pilots numbered 130. The greatest number of gliders and licensed glider pilots in a single state was in California where there were 83 and 21 respectively.

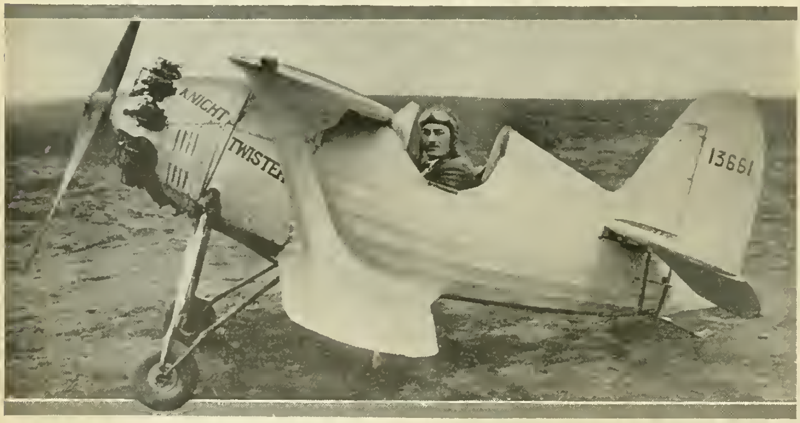
1,815,074 PERSONS FLEW IN 1933

CIVIL AIRCRAFT carried 1,815,074 passengers during 1933 in all types of aircraft including scheduled airliners and with miscellaneous commercial operators and private flyers. These planes flew 125,865,390 miles, comparing with 129,111,667 miles in 1932 when 1,796,490 passengers were carried. Of the total, 1,246,134 flew in aircraft other than regularly scheduled airliners, the planes flying 71,222,845 miles.

Nation-Wide Sky Advertising Planned

KELLETT AUTOGIRO Corp., Philadelphia, Pa., has acquired an exclusive license for the use of the Bleriot sky banner patents in the United States and Canada. These patents cover the release of a furled banner while in flight as well as the banners themselves, and are pooled with Kellett's patent and patents pending. Licenses are being issued for their use throughout the United States and Canada by the Kellett corporation in an effort to better meet the demands of national advertisers.

It is planned to form a group of licensees who will solicit and execute work locally and be in a position to handle those parts of national contracts which are to be executed in their territory, but which they as single, independent operators would be unable to get or execute.



Knight Twister, powered by Salmson engine. This plane, built by Payne Engineering Co., Cicero, Ill., has a cruising speed of 120 m.p.h., and weighs 400 pounds

Engine Production Encouraging

A SURVEY of activity in the aircraft manufacturing industry for the months of January and February, 1934, shows much improvement in commercial airplane engine production as a result of a 105 per cent increase in the value of units produced during the period. However, activity in the commercial and military aircraft manufacturing industry was not as encouraging.

The value of commercial airplane production exceeded last year's total by a slight margin, but the total number of units produced was considerably less than that in the same period of 1933. The 33 units produced this year were valued at $199,971 compared with 57 units valued at $194,899 in 1933.

Military aircraft production was also lower, both in value and units over 1933 figures with 94 units valued at $1,732,239 compared with 105 units valued at $2,182,979.

Commercial engine production increased from 147 units valued at $663,024 for January and February, 1933, to 296 units worth $1,359,707 for the same period of this year. Military engine production, however, also showed a decline with a 1934 production of 84 units valued at $543,960 compared with 116 units valued at $640,811. The value of all production was 4.2 per cent greater than that in the same period of 1933.

Deliveries in the commercial aircraft and aircraft engine field were 31.3 and 61 per cent more respectively than in January and February, 1933, with 43 airplanes valued at $270,806 and 282 engines worth $1,332,732 delivered.

Mattern Joins Pure Oil

JIMMY MATTERN has just joined the aviation department of the Pure Oil Company, Chicago, Ill., and, together with Major D. Young, who is also an executive of the aviation department, will make a general survey and inspection tour of the company's properties and facilities all over the country. The Purol aeronautical equipment at present consists of a Bellanca and Waco.

In addition, Mattern will act as official air ambassador of this year's *A Century of Progress*.

Fairchild Sales Increase

SALES OF Fairchild aircraft recently made include the following:

Warner-powered 22's to Louis De Florez, Aviation Country Club, Long Island and William F. Slaymaker, Lancaster, Pa.; Cirrus 22's to Charles L. Gates, Paterson, N. J., and C. A. Thigpen, Jr., Montgomery, Ala. The sale to Thigpen was made through the Montgomery School of Aeronautics, Fairchild dealer in Central Alabama.

Livingston Now with Waco

AFTER SELLING Waco aircraft for the past nine years as a distributor, Johnny Livingston, famed racing pilot, has become associated with the Troy, Ohio, company as engineering test pilot and chief of production test flying.

Livingston is well known in the racing fraternity for his specialization of adding speed to ships without changing their structural designs. He has been an outstanding race pilot for a number of years and for two years in succession was awarded the trophy at the National Air Races as the outstanding and most consistent pilot at the meets. Flying in the National Reliability Tours, Livingston brought the Ford Trophy to Waco, winning the event two successive years.

Aviation Corp. Profit $596,662

THE FIRST profit reported by the Aviation Corp. since its inception in 1929 was for 1933 when $596,662 was made. Although there was a loss of $160.245 from operations, the corporation made a profit on the sale of securities and commodities. In 1932, there was a loss of $7,865,098.

Current assets on December 31, 1933 were $10,984,911, compared with $10,068,319 a year before. Current liabilities at the end of 1933 were $353,783. Profits from operations before provision for obsolescence and depreciation were $1,293,550 in 1933.

Kinner Appoints Agents

THE APPOINTMENT of two new dealers and the sale of two airplanes has been announced by Robert Porter, president of the Kinner Airplane & Motor Corp., Glendale, Calif., manufacturer of the Sportster and Sportwing aircraft and Kinner engines.

George Leonard, Long Beach, Calif., Municipal Airport operator and Riddell and A. R. Parrish are the new dealers while H. H. Ames of Scobey, Mont., and Dr. J. M. Kolish, Los Angeles, are the new Kinner owners. Ames purchased a Kinner 125 h.p. Sportster while Dr. Kolish took delivery of a new de luxe Sportwing.

(*Continued on following page*)

• Digest of Recent Events •

Piccards Select Detroit For Stratosphere Flight

THE CONTEMPLATED stratosphere flight of Professor August and Dr. Jean Piccard is to be made this summer at or near Detroit, with the wife of Jean probably going along as observer. The Piccards plan to use the same equipment that Major Fordney and Commander Settle used in their record-breaking ascent. They will try to establish a new world's record. APRIL 3.

Polish Balloonists Claim Record for Duration in Air

CAPTAIN Janusz and Lieutenant Warzak, Polish army balloonists are claiming the world's record for a duration flight in a balloon of 750 cu. meters after remaining aloft for 27 hours 45 minutes. They took off from Torun and a mild breeze carried them over Warsaw, then northward, where a landing was made near the East Prussian frontier. The present recognized international record is held by the Frenchman, Jules Dubois, who in 1922 remained aloft 23 hours 28 minutes, in a balloon. APRIL 3.

Girl Is Towed Across English Channel in Glider

JOAN MEAKIN, 23-year-old English aviatrix, crossed the English Channel in an airplane-towed glider. She took off from Ostend, Belgium, and landed at Lympne, but before the tow rope was cut, she circled the airdrome and then came down to a perfect landing, on the field. APRIL 5.

German Pilots Establish Brazil-Germany Record

FOUR LUFT HANSA airplanes, in relay, with the steamship *Westphalen* in midocean as a refueling base, made a trip from Pernambuco to Stuttgart, 5,500 miles, in 2 days 23 hours 45 minutes, cutting by almost 12 hours the last best previous record for the same flight. The mail flew from Brazil to the *Westphalen* in a Dornier flying boat; there it was transferred to another ship and catapulted for the start of the second leg to British Gambia, where a land plane continued it to Seville, where it was again transferred to another landplane which flew on to Berlin after discharging the cargo at Stuttgart, its destination. APRIL 9.

New Altitude Mark Made By Commander Donati

A SPECIALLY constructed Caproni biplane carried Commander Renato Donati, Italian aviator, to a new world's record altitude of 47,340.25 feet. Donati remained in the air for 1 hour 17 minutes before he came down at the Montecelio flying field near Rome. The old record of 44,819 feet was held by Georges Lemoine, French pilot. APRIL 12.

Planes Complete Rescue of Icebound Russians

AFTER TWO MONTHS on floating Arctic ice, with danger increasing daily, 102 Russian castaways who were members of a Wrangel Island expedition aboard the sunken steamer *Cheliuskin* were rescued by airplanes flown by Soviet pilots. The airmen were compelled to fly through Polar storms and to land on a precarious ice floe, but, once the rescue got under way, the mission was carried out with no delay or accident. APRIL 13.

Steam-Driven Airplane Makes Successful Test

SECRET AND successful test flights of the first silent steam-turbine-driven airplane were completed near Berlin in the presence of German army and civilian experts. The engine and plane employ entirely new principles of construction which give extremely high speeds and great load carrying capacity, combined with safety. The engine combines a circular revolving high-pressure steam boiler and a turbine wheel which revolves within the boiler, both of which rotate in opposite directions. There are two propellers and crude oil is used. A maximum speed of 268 miles an hour is reported. APRIL 15.

Macon Reaches Miami After Record Flight

A NEW transcontinental record for lighter-than-aircraft was established by the U.S.S. *Macon* when she completed a flight from Sunnyvale to Miami in 54 hours, 48 of which was consumed in actual flight. The ship is to participate in fleet maneuvers in Caribbean waters and flew east under the command of A. H. Dresel via the southern route to Opa Locka. APRIL 22.

Laura Ingalls Completes 16,000-Mile Solo Flight

THE FIRST solo flight around South America was completed by Laura Ingalls, who visited 23 countries and flew 16,000 miles in a Lockheed plane. By her flight, she became the first person to pilot a plane over the route and the first American woman to fly solo across the Andes. She completed her trip at Floyd Bennett Field, New York's Municipal Airport. APRIL 25.

• Coming Events •

Swiss Air Show

International Show of Sport and Touring Aviation under auspices of Aero Club of Switzerland. Palais des Expositions, Geneva. APRIL 27-MAY 6.

German Cup Race

Deutsche de la Meurthe Cup Race. MAY 27.

Stratosphere Flight

Stratosphere flight under auspices of Army Air Corps and National Geographic Society by Major William Kepner and Captain Albert W. Stevens. Tentative date of take-off JUNE, 1934.

Race Entries Close

Entries close for MacRobertson Cup Race JUNE 1.

Acrobatic Competition

Coupe Mondaile d'Acrobatic Aerienne, international acrobatic competition at Vincennes, France. 300,000 francs in prizes. JUNE 9-10.

Air Race

1934 Legion Air Races. Menominee County Airport, Menominee, Michigan. JUNE 17.

Northwest Air Meet

Northwest Civic Air Meet, Swan Island, Oregon. Under auspices of Northwest Civic Air Meet Association, Larry Therkelsen, managing director, Portland, Oregon. JUNE 30-JULY 1.

Distance-Endurance Contest

Distance and Endurance Contest for 100,000-franc grand prize and 5,000-franc cup. Sponsored by The Aero Club of the West of France in conjunction with the Aero Club of France, Angers, France. JULY 8.

Soaring Meet

Fifth Annual National Soaring Contest, Elmira, N. Y. JUNE 23-JULY 8.

Speed Races

Grand Prix of the Aero Club of France. Speed races between Deauville and Cannes and return for cash prizes and Armand Esders Trophy Cup. JULY 21-23.

Air Tour

Third Air Tour Around Italy. AUG. 1-15.

Polish Tour

International Touring Challenge of the Polish Aero Club. AUG. 28-SEPT. 16.

Gliding Contest

Gliding and Soaring Contest, Big Meadows, Shenandoah National Park. SEPT. 15-30.

Bennett Races

Gordon Bennett Balloon Race. Auspices of Polish Club, Poland. SEPT. 23.

MacRobertson Race

MacRobertson Race, London-Australia. Speed race and handicap race. Under regulations of Federation Aeronautique International and competition rules of Royal Aero Club, 119, Piccadilly, London, W.I. Entries close June 1. OCT. 20.

February Exports Top Million Dollars

DECIDEDLY ENCOURAGING reports of exports of American aircraft, engines, parachutes, spare parts and equipment are evident in the January and February, 1934, review of business with foreign countries. According to the Department of Commerce, Bureau of Foreign and Domestic Commerce, 46 planes and 190 engines accounted for the greatest portion of the business done during the two months when the total value of business reached $1,900,559, of which February sales alone were $1,225,625, one of the finest results in some time.

Germany was our largest customer in February, buying aircraft valued at $150,000, engines valued at $184,942, and accessories worth $138,053. In January, Germany spent $189,488 for engines and $7,613 for parts and accessories. China continued to rank among our best customers, outbuying all other countries in January with a total of $235,360 for 5 planes, 1 engine, $550 worth of parachutes and $22,571 worth of accessories. In February she took 7 planes, 2 engines and $49,681 worth of accessories, the total reaching $266,081. Russia spent $158,361 for engines and accessories in February while Sweden took $53,611 worth of American products during the same month.

Peru took the largest amount of parts and equipment in January, spending $37,524 and adding $7,482 in February. Colombia purchased 5 engines valued at $29,724 in January and spent an additional $8,831 in February.

The 46 planes and 190 engines were valued at $632,496 and $749,124 respectively while sales of aircraft parts and accessories reached $512,289. In addition to the above, Hawaii spent $2,157 and Puerto Rico $310 for American equipment.

Airworthiness Rules Discussed

MANUFACTURERS of aircraft engines and propellers met with officials of the Department of Commerce, Aeronautics Branch in Chicago recently to confer on proposed amendments to the airworthiness requirements for their products and to comment and make suggestions.

The proposed amendments were drafted to bring the requirements into closer agreement with modern developments and practices in the engine and propeller industries. Engine regulations have been reworded and clarified, particularly with reference to altitude engines and the policy of testing at the manufacturer's plant, adopted some time ago, was also included.

CIVIL AIRCRAFT FLY 45,912 MILES PER ACCIDENT

CIVIL aircraft engaged in miscellaneous flying operations flew 45,912 miles per accident during the last half of 1933 and 377,200 miles per fatal accident. This compares with 40,268 miles per accident in the same period of 1932. There were in all, 838 accidents of which 102 resulted in fatalities. The number of miles flown per passenger fatality was 499,667, and the number per pilot fatality was 447,376.

United Aircraft Income $1,176,111

UNITED AIRCRAFT and Transport Corporation and its subsidiaries had a consolidated net income for 1933 of $1,176,111, compared with a 1932 net income of $2,022,736. This is equal to 56 cents a share on the average number of common stock shares outstanding during 1933.

Current assets on December 31, 1933, amounted to $16,037,727, compared with $23,868,217 in 1932. Current liabilities at the end of 1933 were $2,421,517 while in 1932 this figure was $1,865,926. Reduction in current assets is due to redemption of preferred stock outstanding as of January 1 with funds deposited by the corporation with its disbursing agent prior to that date.

Manufacturing subsidiaries had unfilled orders on hand at the end of the year amounting to $10,758,016, of which more than $2,200,000 was for export. During the year 1934 to date, additional orders aggregating $2,868,669 have been received.

Total assets of the company on December 31, 1933, were $33,308,167 compared with $39,207,199 at the end of the calendar year 1932.

Harris Joins Monocoupe

LUKE HARRIS, formerly assistant to Director of Aeronautics Eugene L. Vidal, has resigned his position to become general manager of Monocoupe Corp., Moline Ill., manufacturer of fast, light sport planes. Harris will devote his time between the Monocoupe plant and Lambert Engine Co., an affiliate.

The new Monocoupe with Warner 145-horsepower engine is now being flown on demonstration at Roosevelt Field, Long Island, N. Y. This two-place cabin job, a number of which have been ordered by the Department of Commerce, has shown a 170 m.p.h. top speed.

Curtiss Shows Profit in 1933

NET PROFIT of $135,896 for 1933 was reported by Curtiss-Wright Corp., and subsidiaries after charges, equal to 12 cents a share, on 1,147,491 shares of class A stock. The profit compares with a net loss of $546,574 in 1932.

Current assets at the end of the year amounted to $4,663,699, including cash of $1,482,466; current liabilities were $1,048,780, contrasted with current assets of $4,313,809, cash of $1,326,550 and current liabilities of $1,112,587 at the close of 1932.

Arup Production Under Way

PRODUCTION OF the Arup, the flying-wing craft invented by Dr. C. L. Snyder, has been started in a South Bend, Ind., factory. Simultaneously with the opening of the plant, the Arup Manufacturing Corp. announced the appointment of Ralph R. Graichen as chief engineer and plans for marketing a new and improved model.

Graichen was project engineer and co-designer of the Ford tri-motor; designed and supervised construction of the all-metal Flamingo transport; was with Stout Metal Aircraft Co.; was vice-president and chief engineer of Metal Aircraft Corp., and was with B/J Aircraft Corp., as designer. More recently, he was with Gazley and Lasha, Washington, D. C., consulting firm.

The Arup on which construction has begun, is a small two-place, dual control craft with a 16-foot span and an overall length of 16 feet 4 inches. Powered with a 40-horsepower engine, it has a top speed of at least 90 m.p.h.

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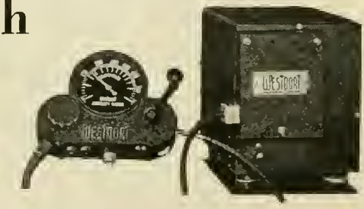

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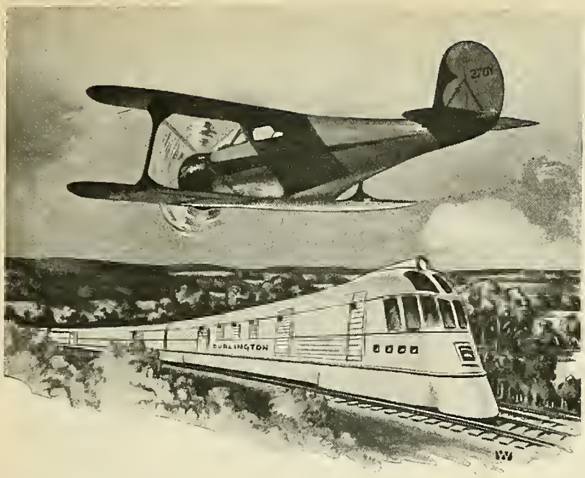
. . . Is designed by engineers whose only standard is perfection.
. . . Is built by craftsmen whose pride lies in the perfection of their work.
. . . Is made of the best of materials which are accepted only after the most exhaustive tests. There is little wonder that Westport owners universally are Westport boosters. Pilots who "fly by Westport" can depend absolutely on their radio to show them through storm and fog and over strange country.

Westport AR62T Remote Control, $245
Other models as low as $99.50

Pacific Airmotive Corp., Ltd.
United Airport, Burbank, Calif.
Oakland Airport, Oakland, Calif.



$200,000 for Streamlining

THAT'S what one railroad appropriated for one new streamlined train.

Streamlining—a relatively new science—is showing the way to new speeds.

More speed . . . faster . . . faster!

Millions of dollars have been and are being spent by railroads, automobile manufacturers, airplane companies and ship builders to decrease air resistance and thereby make possible more speed with less power.

Millions of dollars!

And yet . . . *the ultra-streamlined Beechcraft costs no more.* In fact, this New 225 h.p. Beechcraft offers the last word in streamlining—sound, practical streamlining that gives sensational performance (175 *m.p.h.*) with a minimum of power.

More speed, less power, *no extra cost*—that's the performance record of the New 225 h.p. Beechcraft.

Write for the New Beechcraft catalog.
Read about guaranteed performance.

The Beech Aircraft Company
WICHITA, KANSAS

Study AIRCRAFT where Aircraft is MADE

LOS ANGELES . . . the Laboratory of Aviation is the home of CURTISS-WRIGHT Technical Institute. Nowhere else does the student secure such direct contact with the industry . . . nowhere else is the demand for technical graduates greater. Curtiss-Wright graduates are first to qualify for positions because they study aircraft where aircraft is made.

* * * * *

Curtiss-Wright Technical Institute of Aeronautics, at famous Grand Central Airport, is a recognized educational institution **specializing in two courses: Aeronautical Engineering and Master Mechanics,** under approval of the California State Board of Education and in affiliation with California State Junior Colleges. It is an approved Department of Commerce ground school and repair station and is approved by the U. S. Bureau of Immigration for training non-quota foreign students. Mail the coupon today for 1934 catalog and prospectus. The opportunity in aviation was never greater.

CURTISS WRIGHT TECHNICAL INSTITUTE

CURTISS - WRIGHT TECHNICAL INSTITUTE
Grand Central Air Terminal - Glendale, California

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☐ Engineering Course ☐ Mechanics Course

(Continued from preceding page)

Berry Brothers Shows Increase

INCREASING SALES have been reported by Tom Colby, head of the aviation division of Berry Brothers, Detroit, Mich. In addition to substantial orders from the Boeing Airplane Company, Douglas Aircraft Corp., Curtiss Aeroplane & Motor Corp. and United Aircraft Export Corp., carload orders have been received from Waco Aircraft Co., and Consolidated Aircraft Co. The Curtiss-Wright Export Corp. has also ordered substantial quantities of paint products.

Pure Oil Autogiro on Tour

MORE THAN 100 towns and cities in Florida, Louisiana, Texas and Alabama have been visited by the Pure Oil Company's autogiro flown by Frank Faulkner on a good-will advertising campaign. At the various points of call, prominent members of the community are given rides and a large sky banner, developed by the Kellett Autogiro Corp., is towed over the town.

It is planned to have the autogiro cover nearly all the states in the South, Middle West and East before the summer is over.

Fairchild Speeds Production

DUE to heavy demand for Fairchild aircraft, the Kreider-Reisner factory at Hagerstown, Md., is concentrating production on the 145 h.p. Warner Cabin, the 145 h.p. Warner 22 and the Gipsy 22 models instead of five for the balance of 1934.

Production will be increased immediately, and night shifts are being employed to push deliveries of the new Warner cabin ships, a group of 12 of which was assigned early in April when the first of these three-place jobs was completed. The Department of Commerce has purchased six for its inspectors in the Aeronautics Branch.

A 145 h.p. Warner 22 was shipped to Escuela de Aviaccion y Transportes Civil, Bogota, by Tri American Aviation, Inc. Accompanying this plane was Clyde Pangborn who will demonstrate it to the Colombian government.

Fairchild distributorships have been granted to the St. Louis Flying Service, Lambert St. Louis Field, Robertson, Mo., which took delivery on a Gipsy 22 and three cabin jobs; J. J. Gore, Shushan Airport, New Orleans, who is using a Gipsy 22; Bloomsberg Flying Club, Bloomsberg, Pa., which took another Gipsy 22 and to O. P. Sutton, Cleveland, Ohio, who purchased a Warner 22.

Boeing Prepares Exhibit

FINISHING TOUCHES are being made on one of the new Boeing 247-D transport planes of United Air Lines preparatory to its departure for Chicago where it will be exhibited at the Century of Progress Exposition. This plane embodies a number of features not incorporated in the Boeing 247 shown at the fair last year, including geared Wasp engines and three-bladed Hamilton Standard controllable pitch propellers, standard equipment on the 12 planes being built for United Air Lines.

The plane for the exposition is expected to arrive in Chicago sometime this month, while work on the other 11 is progressing steadily at the Boeing plant with indications for test flights late in June and July.

Erik H. Nelson, vice-president in charge of sales announced the appointment of W. E. Beall as sales engineer in which capacity he will be engaged primarily in liaison work.

Two New Companies in Ohio

INCORPORATION PAPERS have been issued to Forest City Aircraft Corp., Cleveland and to Alliance Aircraft Corp., Alliance, by the Secretary of State of Ohio.

Incorporators of the Forest City company are John A. Hadden, Edward A. Foote, Jr., and Marian Gray while Alex Robertson, William E. Davis and Sydney L. Geiger are named as incorporators for the Alliance company.

If you want some real, low-cost flying...

This FAIRCHILD will interest you!

The operation cost of any airplane is determined by combining the figures for gas and oil, depreciation and maintenance. To achieve real economy, therefore, an airplane must have much more than a low gas consumption . . . it must have durability, ruggedness and quality to survive the abuses of strenuous flying, rough fields and hard landings, as well as the ravages of rust and corrosion.

Most low-priced ships lose more in depreciation and maintenance than they gain in fuel economy. Their initial cost becomes high when divided into actual flying hours.

The Gipsy-powered Fairchild "22" is just the opposite. In design and construction, in quality and workmanship, it is practically a duplicate of the Warner-powered "22" which costs nearly twice as much. The same ball-bearing hinges on ailerons, rudder and elevators, the same sturdy landing gear, the same cadmium-plating, baked-enameling and anodic treatments for rust prevention . . . the same in practically every detail but power and price! Listing at only $2475.00, flyaway Hagerstown, Md., and capable of flying 100 miles on 6 gallons of gas, this ship is America's outstanding value for sportsmen pilots and training school operators. Write for complete details today!

Fairchild Airplane Sales Corp.

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Hand turning starter
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Unequalled rust prevention
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Top speed	110 *m.p.h.*
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Just take one hop **and you'll never be satisfied with any other low-priced plane**

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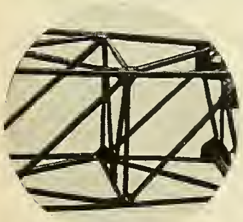

National-Shelby Aircraft Tubing is made to meet United States Army and United States Navy specifications. Carried in stock by distributors at convenient points throughout the country and kept in separate, individual lots with which actual test reports can be furnished at the time of delivery. Inquiries addressed either to the manufacturer or to the nearest distributor will receive prompt attention.

Every resource of metallurgy, of engineering, and of manufacturing technique is employed to make NATIONAL-SHELBY Seamless Aircraft Tubing dependable to the highest degree. Accuracy, thoroughness, and vigilance govern at every point in the making and testing of this modern material. All chrome-molybdenum tubes are made from the finest quality electric-furnace steel. They conform to exacting specifications in all respects and are specified and used by America's leading designers and builders of aircraft. NATIONAL engineers will be glad to cooperate with those interested in the application of tubing to any phase of aircraft construction.

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NATIONAL-SHELBY AIRCRAFT TUBING

STINSON PLANE NEWS

Published by the Stinson Aircraft Corporation, Wayne, Michigan—World's Largest Builders of Cabin Airplanes

Reliant's Value Wins World-Wide Approval

Reliability and Economy again enhanced by many new Airline Transport Features such as Selecti-Glide, Improved Heating and Ventilation, Shrouded Windshield, Vibration Dampened Instrument Panel, better insulation against noise, new comforts, greater speed and superior stability.

RECENT DELIVERIES of the 1934 "RELIANT"

Every Continent Knows the 'Reliant'

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You Get More For Your Money

when you buy the 1934 Stinson Reliant, four-passenger cabin plane.

Read the story of two Revolutionary Developments in the latest issue of Stinson Plane News, just off the press.

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STINSON AIRCRAFT CORPORATION
Wayne, Michigan
Division of Cord Corporation

TRADE LITERATURE

The Wright Cyclone

• ONE OF the best looking and most complete pieces of literature seen in some time is the newest booklet issued by the Wright Aeronautical Corp., Paterson, N.J., describing its Cyclone series of engines.

Expertly put together, the book contains a record of progress as embodied in the 30 years since the Wright Brothers made their memorable flight at Kitty Hawk; a description and detail data on the Cyclone series of engines and a review of the engineering features contained therein. Its illustrations are not only well laid out, but are clear and instructive and should be valuable to the service man in helping him in his problems. A chapter devoted to maintenance should be beneficial.

Concluding chapters contain information and well-illustrated pages on modern high-speed airliners and on military aircraft powered by Cyclone engines.

Cold Finished Shafting

• AMONG THE paramount functions of steel in industry is its use as shafting, and increasing demands for higher efficiency in machinery have focused constantly more and more importance on this type of material.

Union Drawn Steel Co., Massillon, Ohio, manufacturers of this product, has prepared a 16-page booklet, well illustrated, to acquaint the reader with this material which formerly was known, commercially, as Cold Rolled Shafting. Among topics discussed are manufacturing standards, physical properties, specifications and cold drawn and turned and polished shafting.

Bakelite Molded

• TO INDICATE in a clear and concise manner that under the trade name Bakelite, there are a great many materials, the Bakelite Corp., Bound Brook, N. J., has prepared a 48-page booklet entitled "Bakelite Molded."

Replete with well laid-out illustrations, it conveys to the reader the very latest achievements in Bakelite molding materials with particular attention given to special materials manufactured for specific requirements.

Chapters devoted to standard tests, the molding process, the molds, and machinery were found especially interesting.

Light Metal Data

• THE NEW Dowmetal data book explains how this special structural metal may be fabricated by processes common in industry. A description is given of accepted shop practice, and various available forms of Dowmetal such as sand or die castings, extruded shapes, forgings, sheet, plate and strip, are listed and described. Methods of welding, riveting, forming, machining are discussed in detail, with much information on designing and finishing.

This book is most informative and enlightening on the uses, properties and fabrication of this lightest of structural metals and should be helpful to engineers, metallurgists and others.

B. G. Spark Plugs

• AN INTERESTING and educational handbook on B. G. Aviation Spark Plugs, their care, inspection and maintenance has just been published by the B. G. Corporation, New York, N. Y.

A discussion of hot and cold plugs, pre-ignition, fouling, adjustment and a description of the models available are included in this well-prepared and instructive booklet. An engine chart and B. G. Spark Plug Specifications, together with wrenches, tools and spare parts used in servicing plugs, are also found therein.

This booklet should be extremely useful to the maintenance and service station both for airline and fixed base operations, since in it will be found the correct methods to be followed in adjusting and servicing plugs.

Tie Rods

• MACWHYTE CO., Kenosha, Wis., has completed a new catalog on Macwhyte Tie Rods, which is in reality a handbook on tie rods and terminal assemblies.

Its 32 pages include descriptions, diagrams, illustrations and tables on specifications of the streamlined, round drawn and square drawn rods manufactured.

In addition to data on the tie rods, similar data is provided for other products made by Macwhyte such as lock nuts, clevis pins, rigid and safe lock terminals.

NACA Reports

• FOUR INTERESTING technical reports have recently been made available by the office of Aeronautical Intelligence of the National Advisory Committee for Aeronautics, Washington, D. C.

T. R. 474 is a 33-page, illustrated nomenclature for aeronautics (1933); T. N. 493, prepared by M. J. Bamber, is on aerodynamic yawing and rolling moments produced by floating wing-tip ailerons, as measured by the spinning balance; T. N. 494 is a six-page report of a special committee formed to study the hazards to aircraft due to electrical phenomena, and T. M. 738 is on the investigation of a Rateau supercharger for a 700-horsepower aircraft engine.

Neon Flashing Lights

• THE NEW-TYPE safety flasher neon lights manufactured by the Lakewood Engineering Co., Columbus, Ohio, are illustrated and described in an attractive and well-prepared 8-page booklet just issued.

Besides the boundary, obstruction, runway and marine lighting units, there is in this booklet, a number of interesting illustrations showing how these new-type lights can be used, cheaply and effectively, on square, "T" and "L" shaped airports.

In addition, there is a description of the use and installation of special obstruction lights and portable hazard lights. A discussion of adequate, low-cost field lighting and a table of battery operation are included.

Illustrations are in color, well-captioned and present the lighting units in a clear and interesting manner. A description of the airport lights, which are approved by the Department of Commerce, appears on page 59 of the April issue of AERO DIGEST.

Cleaning Handbook

• A MOST complete line of automotive and aviation cleaning and servicing products is described in a 32-page book, "Automotive Cleaning Handbook," issued by the Magnus Chemical Co., of Garwood, N. J.

The requirements of both the aviation and automotive industries demands that cleaning material, used be speedy in action, thorough in results and economical in cost. Because no one cleaner can perform with maximum efficiency on all classes of work, the Magnus company markets a series of cleaning materials, each one of which is best fitted for a definite industrial need. Among these are the Magnus Aviation cleaner for engines and parts and the Magnus Airplane Body cleaner. Airport buildings and hangars can also be kept tidy and clean by the use of some of the other Magnus products, all of which are described in this handbook. Suitable illustrations and a description of the methods used in various cases enable the reader to ascertain more thoroughly the work and results accomplished by these products.

1933-34 Aviation Atlas

• VALUABLE, comprehensive and instructive facts and photographs fill the latest edition of the Aviation Atlas published by the Gulf Refining Co., and distributed to aviation officials, students and enthusiasts. Attractively designed and illustrated, it contains 28 pages of concentrated aviation information. Features include maps and also photographs of many famous fliers.

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BADER FIELD (the fine Atlantic City Airport) is only a short flight from wherever you are. Let us meet you there and whisk you away to Chalfonte-Haddon Hall. Aside from the Atlantic City Horse Show (May 16-19), there are dozens of other diversions to refresh and amuse you. Marvelous meals to climax sparkling hours of fun. Drowsy ocean decks for sunning. Spacious cheerful rooms to induce rest after a day of golf, or tennis, or fishing. Health baths, game rooms, music and hotel entertainments. Rates that tempt you to prolong your stay. American and European plans.

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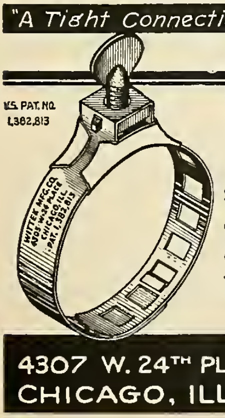
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MYSTIFYING PERFORMANCE
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THE 1934 WACO

CABIN PLANE

The 1934 WACO Cabin Plane is the result of the most advanced airplane engineering. It embodies all the features that made the 1933 WACO Cabin Plane the leader in its field—plus major refinements that add to the pleasure, comfort and enjoyable thrill of flying.

The cruising and top speeds have been increased, yet this new WACO Cabin Plane retains the mystifying ability to get in and out of small fields—tight places that would be shunned by other planes—typical WACO performance.

The fuselage is rounded and the fairing is more complete; including the lower wing, which adds beauty and gracefulness. Controlled interior ventilation brings into the cabin warm, cool or tempered air—as much or as little as you want. There is more leg room for passengers occupying the rear seat. And new, deep, auto type springs in the rear seat cushion and back give additional comfort. Good vision in all directions adds to the pleasure of flying in the 1934 WACO four-place Cabin Plane.

Three power plants are available—the Continental 210 H.P. radial—the Jacobs 222 H.P. radial and the Wright 7-cylinder, 250 H.P. radial. The Jacobs can be had either with the conventional dual Scintilla Magneto or with Bosch dual battery ignition, which includes a generator.

But let us send you complete information. Or, better still, we suggest that you arrange to take a flight with our local dealer. It will not obligate you in any way. If you do not know his name, write us.

THE WACO AIRCRAFT COMPANY, TROY, OHIO

WACO AIRPLANES

"Ask Any Pilot"

WACO LEADS IN AIRCRAFT REGISTRATIONS

FOREIGN NEWS IN BRIEF

Australasia

FOR SPECIAL work on the Perth-Adelaide route, and anticipating the acceptance of its proposal to operate additional lines with improved aircraft, West Australian Airways, Ltd., ordered a D. H. *Dragon*, twin-engined transport plane for use over its lines. The ship has a top speed of 134 miles an hour, cruises at 112 miles an hour and is fitted with adjustable reclining seats and many other improvements.

THE AUCKLAND Aero Club has purchased a wood-working machine and placed it in use in a room formerly occupied for recreational purposes. Relief workers formerly engaged on work on the club's airport were recently withdrawn, apparently as a preliminary step to the organized improvement of landing fields by the Public Works Department, as well as the construction of a chain of airports throughout the Dominion.

REGULAR AIR service between Sydney and Bega has been inaugurated by Adastra Airways, Ltd., following receipt of an air mail contract from the Post Office Department. The company has purchased a new plane and is saving about 10 hours between the two cities over surface transport.

A GROUP of Christchurch, New Zealand, business men are endeavoring to raise sufficient capital to stage an air race from Melbourne to Christchurch as a sequel to the McRobertson Trophy Race. It is planned to post a £5,000 prize.

THE FOURTH annual indoor model airplane championship of N. S. W. was held recently in Sydney with the winner setting a new Australian record for indoor flying at 7 min. 45 sec. It is possible that a team of Australian model builder experts will visit this country to participate in the international flying meet to take place at Akron early this summer.

TATA SONS, Ltd., has for the second consecutive year compiled a perfect score of scheduled flights on the Karachi Bombay-Madras air mail service when 138,600 miles were flown with 10.48 tons of air mail, and 109.56 freight ton miles. Although the service is primarily one for mail, passengers are carried on request and during 1933 a number of people were flown by the company.

Canada

THE McKEE TROPHY, Canada's coveted aviation trophy, was awarded for 1933 to Walter E. Gilbert, pilot for Canadian Airways, Ltd., and stationed at Fort McMurray, Northern Alberta. Gilbert has made many outstanding flights particularly in the sub-Arctic and Arctic regions of the Dominion, and only recently flew the first air mail service to the Arctic Coast at Coppermine.

NEGOTIATIONS are under way between Toronto and London, England, as well as Washington, for squadrons of military planes to take part in the centennial celebrations of the city of Toronto in July, according to H. R. Alley, director of the centennial celebration. There is also a possibility that a large number of American civilian fliers and the entire Royal Canadian Air Force will take part in the air pageant.

FLYING ACTIVITY at the Vancouver, B. C., airport during the first two months of the year was considerably ahead of activity in 1933 and 1932, according to a survey which shows 86 hours 15 minutes for January and February, 1932; 113 hours 45 minutes for the same months in 1933 and 257 hours 40 minutes for January and February of this year.

CANADA is to have a fast transcontinental air service as a result of negotiations between Canadian Airways, Ltd., various municipalities and the Dominion government. A 19-hour Halifax-Vancouver route is to go into service in 1935, the planes carrying not more than four or five passengers, and relying largely on the resumed inter-city air mail service for revenue. British manufacturers are understood to have furnished estimates for mail and passenger planes with speeds of about 200 miles an hour.

The service will bring England within 5 days of Vancouver, allowing British and European mail a fast outlet to the Orient. In summer mail is now delivered in Montreal and Toronto four days after leaving England.

Montreal will be but four hours from Halifax, and 7½ hours from Winnipeg across northern Ontario. Feeder lines will connect Toronto via North Bay to Winnipeg, and from there to Vancouver via Medicine Hat and Crow's Nest Pass in eight hours.

SERVICE TO Bridge River was inaugurated by Wells Air Transport, Ltd., when a 6-place Boeing Flying Boat took off from Vancouver, B. C., for the first flight between the two points. For the present, service will operate once weekly.

Great Britain

A. V. ROE and Company, Ltd., has acquired the license to manufacture, use and sell autogiros from the Cierva Autogiro Company, Ltd., and plans to place in immediate production the C30P, the model without rudder, elevator or ailerons. The work of these is performed by a lever which enables the pilot to change the angle of tilt of the rotor axis relative to the body of the machine.

Avro plans to make every effort to market the autogiro in England on a large scale and production aims at the Manchester factory anticipate a good demand for the autogiro.

GREAT BRITAIN will fly her mails all the way from London to the Dominions following the acceptance of terms permitting such flights by the Italian government. The rail stage between Paris and Brindisi, taking some 30 hours, will be replaced by an aerial journey, cutting one day in all of Imperial Airways' time schedules to points east and south of Egypt.

AS THE RESULT of a merger of the Hawker and Gloster interests, it will not be long before Hawkers may be produced in the Gloster works at Hucclecote, Gloucestershire. Under the terms of the agreement, the Hawker company acquired a controlling interest in the Gloster company, but each firm will continue in separate operation, however, with close liaison and interchange of information between

P. & W. Hornet-powered Northrop Delta for A. B. Aerotransport of Sweden

(*Continued on following page*)

JACOBS 225

THE POWER PLANT CHOSEN BY THE WACO AND BEECH AIRCRAFT COMPANIES IN OFFERING TO THEIR CUSTOMERS THE MAXIMUM IN PERFORMANCE AND RELIABILITY COUPLED WITH LONG LIFE AND LOW OPERATING COSTS

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The JACOBS 225 offers lowest weight-to-power ratio of any engine within 100 h.p. . . . battery ignition . . . accessibility and simplicity . . . long life . . . low service costs . . . and other advantages worthy of your investigation.

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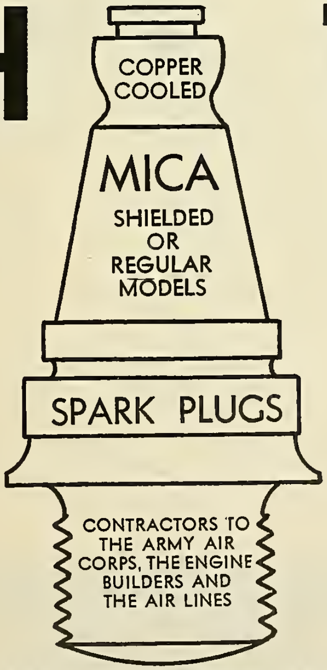
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4. AVIGATION, METEOROLOGY and AIRCRAFT INSTRUMENTS

Each of these courses offers a means of improving your opportunity. Each was prepared for people *already in aviation.* Prices have been purposely kept low, with extended monthly payment privileges if desired. *Write to us today, for full details, addressing:*

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Extension Dept., Hangar 5C
Oakland, California

(*Continued from preceding page*)

the design, production and administrative staffs. Hawker interests will be represented on the board of the Gloster company, which will remain under the direction of Hugh Burroughes.

TO FOSTER aviation and to point out the advancement it has made, the Air League is sponsoring an Empire Air Day on May 24, and thereafter annually on the same date. It is planned to reveal to the public as much as possible of things and activities associated with flying that are usually closed to public scrutiny or investigation. Present arrangements call for opening to the public all civil and military airports, aircraft and aircraft engine factories and workshops, with flying displays and aerobatic flights included in the program.

Germany

IF A DECISION as to what engines will power the LZ 129 is reached soon, the newest German dirigible will be ready this fall for its maiden trip. At present only the stern skeleton, in which will be the steering apparatus, remains to be set in position.

Without this section, the ship measures about 620 feet, but when completed the LZ 129 will measure more than 810 feet, 42.6 feet more than the Graf Zeppelin. Despite this slightly greater length, the new dirigible will have almost double the gas capacity of the Graf.

HEAVY INCREASES in estimates for air ministry and the army feature the budget for the fiscal year beginning April 1. The German Air Ministry estimates were increased by $20,004,000 to provide the country with an aerial fleet for protective purposes. The total air appropriation is approximately $84,000,000.

THE FIRST performance of a modern military fighting plane in Germany was given by Ernst Udet, who demonstrated at the Templehof Airport in Berlin, a Curtiss Hawk fighter powered by a Wright Cyclone engine. More than 150,000 persons watched the flier put his American ship through its acrobatic paces, among whom was the former Crown Prince. After the air show, Luft Hansa took 1500 persons for joy hops within one hour.

Italy

PREMIER MUSSOLINI has appointed Squadron Gen. Giuseppe Valle as chief of the air force to succeed Gen. Antonio Bosio, who has been relieved of his post. Gen. Valle has been under-secretary of air and in 1930 was a leader of the Italian mass flight to South America.

MILAN WILL have its first Exhibition of Aeronautics when the Esposizione Dell'Aeronautica Italiana opens on June 16 for an extended run until October. Aided by the Italian Ministry of Aeronautics and the local municipal authorities, the Milan exhibition is expected to be helpful in depicting the progress of Italian aviation and of offering a general view of aviation development from the World War to the present day and from the early Leonardo da Vinci flights to Francisco Agello's record breaking assault on the world's speed mark.

Special preparations have been made with the Italian State railroad so that tourists and others can cheaply make the trip to Milan for the exhibition which will be held in the Palace of Arts in the public park of the town.

Mexico

COMPANIA AERONAUTICA del Sur, a newly organized company, has applied to the Aviation Department of the Ministry of Communications and Public Works for authority to operate airlines between Villahermosa and Jalpa, Comalcalco and Puerto Mexico and from Villahermosa, Talpa, Pichucalco, and Tuxtla Gutierrez.

THE NATIONAL Revolutionary Party, which dominates the Federal Government, has obtained a plane for propaganda purposes, with particular reference to the promotion of the six-year plan of national economic and social development that the administration is working out. The plane is visiting all cities and towns of any importance.

Russia

FURTHER INVESTIGATIONS of the stratosphere will be undertaken by Osoviakhim, the national aviation organization which sponsored the fatal ascent of the stratostat *Osoviakhim I* last February. In an effort to gather additional information, a new attempt will be made in a specially designed "chair" fastened to a balloon which it is hoped will ascend 15 miles into the stratosphere.

The tiny open cage will carry instruments, tanks of oxygen for the pilot, who will wear an outfit similar to a deep sea diver's uniform, and batteries to supply electric current to warm him in the higher altitudes. The pilot will take readings through the windows of his helmet and communicate by radio with the earth. The most novel feature of the proposed plan is the decision to sacrifice the balloon when it has reached its maximum height. The pilot will cut himself loose from the bag and descend to earth in the chair with his instruments, by means of a special parachute.

THE GROWTH of civil aviation in the Union of Soviet Socialist Republics is indicated in the following table compiled by the Amtorg Trading Corporation, the Russian trade organization in the United States:

	1923	1925	1928	1930	1932
Length of lines (thous. mi.)	0.9	3.1	7.0	18.1	22.8
Distance flown (million mi.)	0.18	0.55	1.7	3.7	4.3
Passengers (thous.)	2.9	6.1	10.6	17.8	31.6
Mail (tons)	3.4	13.4	93.2	116.6	454.0
Freigbt (tons)	2.3	72.3	162.2	206.4	552.0
Aerial Photography (thous. sq. mi.)	..	0.3	11.8	34.7	44.4
Agriculture and forestry land treated against pests (thous. acres)	..	3.2	83.0	172.7	1060.0
Sowing by plane (thous. acres)	..	..	..	10.3*	143.3

*1931

Sweden

A. B. AEROTRANSPORT, Sweden's best-known airline, has just purchased an all-metal, low-wing Northrop Delta from the Northrop Corp., Inglewood, Calif. The plane has accommodations for eight passengers in addition to the pilot and is equipped with a P. & W. Hornet T2D1 engine rated 660 h.p. at 2,000 r.p.m. and the latest type Hamilton Standard controllable pitch propeller.

SWEDISH AIR traffic in 1933 increased over previous years as indicated by traffic figures for the Malmo airport. During the year 7,343 planes arrived and departed, with 3,380 being in scheduled service. These latter carried 11,227 passengers, 271,388 pounds of mail and 433,640 pounds of express.

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AVIATION GASOLINE
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Broaden your RANGE and watch PROFITS jump

Land planes are quickly convertible for water flying with EDO all-metal Floats, thereby doubling the range of service for commercial operators. Profits increase by even greater ratio. Seaplane landing places are not costly—often free. In regular air ferry service, airline operation to summer resorts, vacation charter, sightseeing hops, the seaplane has no rival as a profit maker.

EDO Floats are the product of the world's largest exclusive manufacturers of seaplane equipment. They are built by men who know the operator's requirements. EDO Floats hurry heavy loads off the water and stand up in the toughest service — yet have negligible effect on performance or payload of the average land plane.

Practically every well-known make of ship is licensed for EDO Floats in the United States and Canada. Standard installations, easily interchangeable with wheel landing gear, are promptly available.

Go out and get new business with EDO-equipped planes. Make 1934 a dividend-paying year. Interesting information will be gladly furnished to airline operators and commercial owners.

Address: EDO Aircraft Corporation, 610 Second Street, College Point, Long Island, N. Y.

EDO

Distributorships for live wire operators of EDO-equipped seaplanes are available in a few localities.

SELL OUT!

THE INCREASING demand for THE SPORTSMAN PILOT has reached the point where each issue is a complete sell-out ten days—and sometimes sooner—after the magazine comes off the presses. We are not always able, for that reason, to fulfill requests for back copies; or to include the current issue in subscription orders that reach us at the end of the month. ¶ It is suggested that new subscriptions be mailed at the earliest convenient date. ¶ Subscription rates are—$3 a year; two years for $5; or, on Combination, one year of THE SPORTSMAN PILOT and one year of AERO DIGEST, $5.

Issued on the fifteenth of the month.

THE SPORTSMAN PILOT

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PERSONAIRLITIES

(*Continued from page* 53)

flight the experimental dirigible broke in two, carrying its crew, 29 English and 15 American, to their deaths.

While the devoted little band comprising Lakehurst's first class pursued their studies and hopeful speculations about how to stay in the Navy's airship section and yet remain alive, the ZR-1 was nearing completion in Lakehurst's hangar. It was a synthetic compound of hopes, plans of German Zeppelins, and enthusiasm. In September, 1923, it was launched and named the *Shenandoah*. It made 56 successful flights and flew 25,000 miles up to August 22, 1925, by which time the Navy had learned a great deal about airship operation, and so had Lieut. Rosendahl, who remained with the ship as navigator and mooring officer for its whole life.

During this time the ZR-3 had been delivered from Germany (the only thing we ever got from Germany besides a couple of ocean liners that we snatched during the war). This ship was christened the *Los Angeles* and had been flown by laying up the *Shenandoah* and transferring that ship's supply of helium gas to the *Los Angeles*. There was only enough gas for one ship in those days, though if the Democratic propaganda bureau had been in operation at that time it would have been possible to inflate both. Lacking it, the Navy flew each ship in turn, transferring the helium back into the *Shenandoah* for what was to be her last flight, Sept. 2, 1925, when she was lost in a disaster caused by a line squall over Ohio. Lieut. Comdr. Rosendahl rode part of the *Shenandoah's* ballooning wreckage safely to the ground, stepping out of it to become Executive Officer and second in command of the *Los Angeles*, March 15, 1926. In May of that year he took over command from Capt. George W. Steele, and for three years commanded that excellent German Zeppelin, making glorious airship history. Then he spent a year in command of Rigid Airship Training, and developed handling and mooring projects and equipment, including the mobile mooring mast, his own idea. He made a world flight on the *Graf Zeppelin*, took over command of the *U. S. S. Akron* when it was completed, and remained with that ship until ordered to sea duty, from which he has now returned to command the Air Station at Lakehurst.

Those of us who know and admire Commander Rosendahl for his splendid work in the Navy's development of large dirigibles, in spite of distressing set-backs and discouragements, are happy to see him back in the lighter-than-air section after his necessary tour of duty at sea. I haven't seen him since November, 1931, when I flew as a passenger in the *Akron*, which he then commanded. Meanwhile he was on the *U. S. S. Portland*, but I always considered him as being merely lost at sea, as his obviously most useful place is with the Navy's airship section. Well, he's back, and in command of Lakehurst; and we're all mighty glad.

I have a letter dated June 23, 1933, from the Hon. H. L. Roosevelt, Acting Secretary of the Navy, which states in part: "To the previous assurance that your views on the subject of airship operation will be given careful consideration, I can add only the further assurance that in all branches of the Navy every effort is always made to avoid unjustifiable over-boldness of any sort, and that you may expect this policy to be properly emphasized in future airship operation."

I have great confidence in the Hon. H. L. Roosevelt. I believe that he means everything he says.

My letter to the Secretary of the Navy merely stated my opinion that in view of two major airship disasters the general inexperience and incompetence of the Navy's Lighter-than-air department was a matter of common knowledge, and would he kindly see to it that every effort should be made to safeguard the operation of the new *Macon*, and not let it be destroyed through the inexperience or over confidence of its crew.

It looks like the good assistant secretary took my letter very seriously for it was not long after that Comdr. Rosendahl was ordered to the command at Lakehurst.

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2. The Boeing 247 transport's literature is available to airline executives and other American and foreign users of large aircraft .... **Page 41**

3. The "Luxury Airliner," by Douglas, is described in a booklet for airline officials and other operators of high-speed large payload aircraft... **Page 6**

4. The Wright Gipsy-powered Fairchild 22, as well as other popular Fairchild planes, is described in an attractive booklet for private pilots and commercial operators.. **Page 72**

5. Private fliers and commercial operators are invited to write for literature describing the new Stinson "Reliant" and its "Selectiv-glide" speed arresters .... **Page 73**

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7. Dealers, operators, private pilots: Amphibions, Inc., offers a new Privateer amphibion; write for their literature .... **Page 65**

8. Hammond aircraft offers a new three-place biplane. Write for the catalog........ **Page 80**

9. The Lambert Aircraft Corp. offers commercial operators and private fliers three new Monocoupes — with choice of Warner Super Scarab, Scarab, and Lambert engines... **Page 4**

10. Airline executives — here and abroad—for comfort, payload and economy, investigate the modern Curtiss "Condor" transport .... **Page 33**

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19. Aircraft operators, engineers and manufacturers will find much of interest in the literature describing Hamilton-Standard controllable pitch propellers .... **Page 37**

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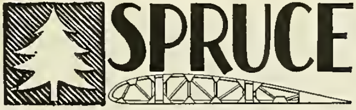

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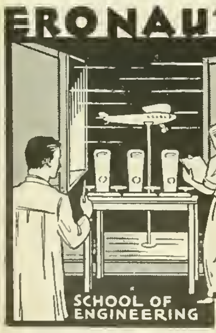

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WARNER WACO F: Excellent condition; steel prop, new covering, 600 hours total. Must be seen to be appreciated, $1,500 cash. F. A. Wehler, Littlestown, Pennsylvania.

FLAMINGO: Wasp C, eight-place, all metal, perfect condition. Ideal passengers, freight. Electric starter, generator, radio, lights. $1,850. Address 1745 Continental-Illinois Bank Building, Chicago, Illinois.

FOR SALE: Genet-powered NB-8. Licensed, good shape, always hangared, never cracked. Total time 300 hours. A bargain, $575. Frank Allen, Green Valley, Illinois.

FOR SALE: Fleet, K-5 Kinner with new type heads, complete night flying equipment. Write or wire W. M. Campbell, c/o TWA, Port Columbus, Ohio.

FAIRCHILD 22: Cirrus. A-1 shape, never cracked up, always hangared, privately owned; 295 hours (50 hours since top overhauled) $1,500. Firman Church, 175 Lewiston Street, Willimantic, Conn.

FOR SALE: C-2 Aeronca; new airwheels, major overhauled, perfect condition or will trade in on Aeromarine, Rearwin Jr. or other two- or three-place air-cooled ship. S. F. Sapp, Albany, Georgia.

SELL OR TRADE: Stinson 330 h.p., six-place, has ATC for floats. Travel Air 175 h.p., model E-4000. Driggs Skylark powered with Rover 75. Travel Air OX, stressed for J-5 Wright. Sell with either motor. Waco 10, OX-5. Lincoln Page, OX-5. All licensed and in A-1 condition. Central Air Service, Grand Rapids, Michigan.

FOR SALE: Cleanest, fastest OX-Robin in country. Millerized, Bosch mag., Fahlin prop, spinner, extras. Licensed, condition excellent. Motor turns 1480 on ground. Always hangared. Never cracked. Also OX parts. Bill Clifton, Harris, Iowa.

TWO-PLACE full cantilever low-wing all aluminum monoplane with experimental license, less motor, $700 cash. Write for details. Brown Metalplane Company, Spokane, Washington.

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180 H. P. CHALLENGER COMMAND-AIRE: Licensed until April 1935. Excellent condition. Short time since $800 motor overhaul. Wings and tail recovered last spring. $1,200. D. F. Burns, Municipal Airport, Denver, Colorado.

FAIRCHILD KR-34: Wright J6-5, completely modernized, including impeller clutch; less than 100 hours since major overhaul. Fuselage and tail surfaces recovered. Extra equipment includes rate-of-climb, turn-and-bank, Eclipse starter, oleo landing gear, semi-airwheels and brakes, pressure Pyrene fire extinguisher. Total time on ship and engine, including ground time, 446:15. Lowest cash price—no trades—$1,250. Air Service, Inc., Bellanca Field, New Castle, Delaware.

FOR SALE: Eaglet, Szekely overhead motor; licensed to April 1935; $600. Henry Ludwig, R. D. No. 4, Pottstown, Pennsylvania.

FOR SALE: Cirrus-powered Great Lakes, licensed to April 1935. Completely overhauled and recovered. Custom finish, cream and red. Engine less than 50 hours. Beautiful ship, plenty extras. $1,185. OR WILL TRADE for Aeronca, plus cash, depending on condition. E. Burke Wilford, Wilford Bldg., Philadelphia, Pennsylvania.

ARROW SPORT: LeBlond. NC licensed. Excellent condition. 86 hours total flying time. Always hangared and privately owned. Never cracked. Richard F. Smith, YMCA, Beverly, Massachusetts.

SIKORSKY: Ten-place, latest type, twin-motored. Just overhauled. Like new. Will sell or consider working proposition. Frederic Lord, 63 No. Maple, East Orange, New Jersey.

FOUR-PLACE SHIP: $1,350. Licensed J6-7 Verville Aircoach. High finish, starter, lights, roomy cabin, splendid performance, slow landing. Monty Barnes, Municipal Airport, Wichita, Kansas.

STINSON Lycoming Junior: Late 1930, licensed April 1935. Has had splendid care, never cracked, guarantee 800 actual hours, rare bargain, $1,275. No less. Jones Repossessed Car Sales, 121 Alexander St., Rochester, N. Y. Phone: Main 8019.

FOR SALE: 1933 Stinson Reliant, with $1,300 extra equipment; radio, blind flying instruments; perfect condition; flown 325 hours by experts; no accidents; price $4.000. Seen by appointment. Phone DIgby 4-6624. Room 1702, 99 Wall St., New York, N. Y.

LYCOMING STINSON cabin: Late 1933 Executive model. Absolutely brand new condition. Radio, flares, landing lights, blind flying instruments. Write AERO DIGEST, Box 1768.

BUHL BULL PUP: 110 hours total time. Never cracked, always hangared. Just relicensed. Szekely 45 motor, good condition, cylinder hold-down rods on motor. $600. R. R. Carlisle, 6900 Division Avenue, Birmingham, Alabama.

CURTISS J6-5 DE LUXE ROBIN: For sale or trade. 430 hours total time. Seven hours since top overhaul. Licensed to April 1935. Bank and turn, rate of climb, compass, radio-equipped, navigation and landing lights. Equipped for photography. Dual controls, tail wheel. Always hangared. Excellent condition. C. Seidel, 425 Lake Avenue, Park Ridge, Illinois.

FOR IMMEDIATE SALE or exchange: 12 certified airplanes, as follows: J-5 Waco Seaplane, fully equipped with Edo floats and Heywood air starter, condition like new throughout; 75 h.p. two-place Driggs; J6-9 330 h.p. Straightwing Waco; Kinner 100 h.p. Fleet; Warner 125 h.p. Waco F; J6-7 250 h.p. Tapering Waco; OX-5 Robin cabin ship; OX-5 Waco; 2 J6-9 330 h.p. 6-place Travel Air cabin ships; Wright Cyclone-powered trimotor 20-passenger Patrician. All ships in excellent condition throughout. Photographs furnished if you mean business. Will accept good late model cars on deals. Terms to responsible buyers. Buy now before prices advance. Becker-Forner Flying Service, Inc., Jackson, Michigan.

STEARMAN C3R: Wright E J6-7 engine; 87 hours since complete overhaul, landing lights, direct electric starter, generator, bank and turn, rate of climb, NACA cowl, tail wheel, white with gold wings. Entire airplane recently reconditioned at Stearman factory. Excellent buy, $3,000. Du Pont Airport, Wilmington, Delaware.

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45 H.P. SZEKELY and propeller; 260 hours total; just overhauled, has heavy type crankcase, $175. Also, empennage, landing gear and wheels for Curtiss Jr., cheap. Tred Avon Flying Service, Inc., Easton, Maryland.

FOR SALE: Short nose American Eagle. Can't be told from new. Motor just overhauled. Special paint job, steel prop, airwheels, airspeed, compass and collector ring. Philip Miraglia, 208 Irvington Drive, Tonawanda, New York.

D. H. MOTH: Steel fuselage, airwheels, thermopete, special paint job, Pioneer instruments including airspeed, cockpit and engine covers, duals, full set of tools, navigation lights, new British airscrew, engine factory majored recently. Excellent condition. Licensed August 1934. $875 cash. Ship in New York area. AERO DIGEST, Box 1774.

STINSON SW with Wasp Jr 300, perfect condition, only 280 hours. Will cruise 125. Completely streamlined. Equipped Sperry horizon, directional gyro, drift indicator, climb and bank indicators, clock, landing lights, generator, special leather upholstering, blue and gold paint. Price $4,150. Allowance made if additional equipment not desired. Can be shown in New York. STINSON SM8A: 395 hours, motor completely modernized. Equipped airwheels, turn and bank, rate of climb indicators. Price $1,700. FAIRCHILD 24 cabin, Cirrus motor, 10 hours since complete factory motor overhaul. Navigation lights, turn and bank indicator; price, $1,850. K. Russell Smith, Wilkes-Barre Wyoming Valley Airport, Forty-Fort, Penna.

LAIRD SPEED WING: Wasp C. Total time, 240 hours; extra instrument; full NACA cowling; cruises 160; excellent condition; $3,500; cost new $21,000. Louisville Flying Service, Louisville, Ky.

LATE BELLANCA Skyrocket with 10 to 1 blower. Less than 400 hours' total time. Radio and blind flying instruments. Excellent condition. Ship has been used privately. All offers will be considered confidential. Blue Bird Air Service, Inc., 5214 West 63rd Street, Chicago, Illinois.

FOR SALE: J6-9 330 h.p. 6-place Travel Air cabin ship. Excellent condition throughout and fully equipped for night flying. Terms to responsible buyers. Michigan Aero Motors, Jackson, Michigan.

WARNER PRIVATEER Amphibion: 200 total, 15 since major; $1,000. Licensed, including bank and turn, rate climb, air speed. Ship now being overhauled for license. A. Hartung, Room 301, 63 Wall Street, New York, N. Y.

MONOCOUPE: Powered with latest type 125 Warner. Ship completely streamlined, including ring, pants, faired strut ends, etc. Other extra equipment includes rate-of-climb, turn-and-bank, special compass, parachute-type door, special paint job, black fuselage, cream wings, vermilion trim. Ship has had 125 hours since new last September and cannot be told from brand new. Lowest cash price, $3,500. Air Service, Inc., Bellanca Field, New Castle, Delaware.

CURTISS-ROBIN 3-passenger, Wright 165 h.p. J6-5 motor, guarantee 350 actual hours, never cracked, licensed June 1935. Real beautiful job and best Robin in country; real buy, $850. No less. F. A. Jones Repossessed Car Sales, 121 Alexander St., Rochester, N. Y. Phone: Main 8019.

FOR SALE: Millerized OX-5 Travel Air. Sacrifice for quick sale. $160. Lower panels and fuselage need recovering. Detachable motor mount. Al. Sielaff, Route 1, Alden, Texas.

WACO OX-5: Licensed. Completely overhauled and recovered, just out of shop; looks and flies like new. Motor extra good. Ship ready for hundreds of hours of trouble-free service. Exceptional buy at $485. See any time at Airport, Mount Healthy, Ohio.

PITCAIRN AUTOGIRO: Like new; two-place. Kinner motor, starter, brakes, lights, steel propeller, $1,500. Will deliver anywhere for expenses. AERO DIGEST, Box 1775.

$285 WILL BUY licensed American Eagle, OX-5 motor, just rebuilt completely; Miller overhead, new propeller, instruments, duals. First deposit gets preference. Pioneer Aviation Co., Airport, Syracuse, New York.

FLEDGLING for sale or trade: Safe, dependable; black and silver; Curtiss Challenger: 239 hours since major overhaul, good condition throughout. Interested in Bird, preferably four-place, or two-place Aeronca. Box 1118, Raleigh, North Carolina.

OX-5 MOTORS: Just purchased from the Government. Guaranteed brand new and complete. Shipped privilege inspection. Reasonable price. Grant Marine Motors Co., 827 Whittier, Detroit, Mich.

AMERICAN EAGLET: Salmson engine. American Eaglet: Szekely engine. Both good as new and licensed. Dual controls, standard instruments, color red and yellow. Jesse Jones Airport, Lancaster, Pennsylvania.

STINSON J-5: Six-place. Licensed March 1935; never cracked. Excellent condition, ready for unlimited cross-country service. Bargain for $1,350. Spencer Laboratories, Akron, Ohio.

LAMBERT MONOCOUPE 90: Price, $1,750, flyaway Lambert Field. Ship has had between 250 and 300 hours. Motor and ship in extraordinarily good condition. Painted red and black. Equipped with booster, compass, clock, all instruments. Ship has had about 20 hours since being thoroughly overhauled, motor checked; installed new valve guides, pistons, rings, and all parts showing any evidence of wear. LAMBERT MONOCOUPE 90; Price, $1,650, flyaway Lambert Field. Licensed to August 1934. Just had new factory rebuilt motor installed. Covering good. Painted International orange trimmed in black; wheel pants, compass, navigation lights, cabin heater, racing type wire braced landing gear. Special streamlining on wing struts and tail group. LAMBERT MONOCOUPE 90: Price, $2,000, flyaway Lambert Field. Ship painted Stearman vermilion and Diana cream trim. In excellent condition. All instruments, including rate of climb and turn and bank. Electric starter, battery, compass, navigation lights, wheel pants, etc. Ship has had about 20 hours since factory rebuilt motor installed. WACO CABIN "C": Price, $3,500, flyaway Lambert Field. Total time 335 hours, 35 hours since top overhaul; new rings and pistons. Lear Radio "B" eliminator; metal propeller; wheel pants, Heywood starter; color: fuselage black, aluminum wings and trim. Plane in excellent condition. Powered with 210 h.p. Continental motor. WASP RYAN B-7: Price $3,000, flyaway Lambert Field. Built late 1930. Total time 507 hours. Motor and ship in excellent condition. Silver finish. Landing lights, special Pioneer instrument board. Always privately owned and stored in private hangar. Monocoupe Corporation, Robertson, Missouri.

LINCOLN PAGE OX-5: In A-1 condition. Overhauled, recovered and like new. New Marshall prop. Ship always hangared. Licensed. Price $375. Sell or trade. Central Air Service, Grand Rapids, Michigan.

FOR SALE: Warner Scarab 125 h.p. motor. Also J6-7 250 h.p. motor. Both in excellent condition. Priced for quick sale. Michigan Aero Motors, Jackson, Michigan.

FOR SALE: Wright Whirlwind J6-5, 175 h.p. motor. Also J6-9, 330 h.p. motor. Both in need of overhaul. Submit us best cash offer. Michigan Aero Motors, Jackson, Michigan.

STINSON LYCOMING: Licensed until February 1935. Only 250 hours. Complete night and blind flying equipment; $1,500. D. C. Fonda, 175 Fifth Avenue, New York, N. Y.

WARNER PRIVATEER; Kinner Pitcairn Giro; OXX Command-Aire; Waco 10. Fine shape and low prices. Ryan B-5 motor mount; Lockheed parts; Model A Eaglerock parts; Waco F-2 center section and right upper. Charley Raudabaugh, 13210 French Road, Detroit, Michigan.

Used Planes and Engines

FOR SALE: 150 h.p. Hisso Waco DSO, A-1 condition, just relicensed, privately owned, always hangared, looks good and is good; priced to sell. A. J. Bollier, Wolcott, Indiana.

PITCAIRN OX-5: 3-place open biplane, new cover and propeller; ship excellent flying condition. Sell or trade on Waco F, J-5 Waco, 2-place Aeronca, late model automobile or Challenger Robin. Send picture your offer. Watson S. Eaddy, Johnsonville, South Carolina.

WACO CABIN: Continental 210. Excellent condition. Extras include: Wheel pants, steel propeller, leather upholstery, lights and flares, wing root fairing, 70-gallon gasoline tanks, special paint job. Bargain. The H. C. Robbins Co., Waco Distributors, Cleveland Airport, Cleveland, Ohio.

KELLETT AUTOGIRO: 210 h.p.. Ship and motor in excellent condition. Fully equipped for sky sign towing. AERO DIGEST, Box 1772.

WACO 10, $270; Swallow T-P, $275; Hisso Eaglerock, $395; J-5 Waco, $900. Hundreds of others, $80 up, flyaway. Motors, crack-ups. Owner's price, name and address. Send 20c sample copy, $1 for six months. Used Aircraft Directory, Athens, Ohio.

FOR SALE: OX Travel Air; Challenger Robin. Want cracked Lambert or Warner Monocoupe, or will sell Monocoupe wing and landing gear. C. W. Siehl, Sherburne, Minnesota.

AERONCA 30 h.p. motor, with Supreme propeller. Just overhauled, with new cylinders, pistons, valves and connecting rod rollers. Heath parts. A. C. Fowler, Hurricane, West Virginia.

STRAIGHT WING Waco J-5: A-1 condition, zero hours since completely recovered and major overhaul on engine. Just like new. $1,700. J. McBride, 4703 W. 65th Street, Chicago, Illinois.

FOR SALE: Waco A. S. O. model, J-5, very good condition, streamlined, metal propeller, licensed until December 1934. Glenn W. Sheren, 1116 So. Washington Ave., Lansing, Michigan.

FOR SALE: Curtiss Challenger engine, 185 h.p., serial number 267, completely overhauled and painted; all worn parts replaced. Price $225. Moline Airport, Moline, Illinois.

CURTISS four-place flying boat: Completely rebuilt, licensed. Beautiful job. Most economical and efficient job for passenger flying. Edward G. Pennock, 1700 Girard Trust Building, Philadelphia, Pennsylvania.

TRAVEL AIR OX-5: Ship completely recovered and reconditioned. Stressed for J-5 Wright. Equipped with Flottorp prop, 30 x 5 wheels and tires, licensed. Price $575. Sell or trade. Central Air Service, Grand Rapids, Michigan.

KEYSTONE K-84 Commuter: (4PCAmB); as good as new. Complete, flyaway, $4,500. Will sell less engine if desired. Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

DAVIS: LeBlond 85: new, just test flown and licensed; NACA cowling, front pit cover, compass, air speed; $1,800. Accept car for part. William Moffitt, Muncie Airport, Muncie, Indiana.

FOR SALE AND TRADE: Certified used and reconditioned ships, of all types and makes, at almost your own prices. Write for list. Omaha Aircraft Brokerage Service, South Omaha, Nebr.

OX-5 CHALLENGER: Excellent condition. New motor, genuine OX. Licensed to February, $650. Also used OX-5. W. R. McKnight, Hightstown, New Jersey.

CONTINENTAL 165 Aristocrat: New fabric, attractive colors, excellent condition throughout; steel prop, navigation lights, etc. Small number hours. $1,200 cash. Investigate. B. Purnell, Dover, Delaware.

WACO 9: OXX-6 motor, Hamilton prop, good clean condition, never cracked. $300 or trade late car. E. E. Laurence, 29 Tichenor Street, Newark, New Jersey.

FOR SALE: Waco four-place cabin, late 1933 model; flares, landing lights, radio; total flying time, 75 hours. Will sacrifice. AERO DIGEST, Box 1780.

BARGAIN: Curtiss Junior, 45 Szekely-powered; wings and structure strengthened. Motor major overhauled 35 hours ago. Ship recovered recently. It's a steal at $450 cash. Will consider trade on larger ship. Call Newtown 9-2867 between 6 and 7 p.m. Write D. Franklin, 37-52 89th Street, Jackson Heights, New York.

BARGAIN FOR $850: Spartan 3-place open, J6-5, metal propeller, booster, full set instruments, 65 gallon tanks. Recently recovered. Licensed next July. Airview Flying ervice, Red Bank, N. J.

HISSO EAGLEROCK: Licensed till April 1935. Completely overhauled for inspection; compass, brakes, booster. Will sacrifice for $375, or trade for closed job. Philip T. Stuller, 163-02 Hillside Avenue, Jamaica, N. Y. Jamaica 6-9197.

FOR SALE: Travel Air Sport, 3-place open, Kinner 125 powered, new steel prop, brakes, all latest equipment; just major overhauled, like brand new ship; will consider trade on Bird or two-place Aeronca. Meriwether Aircraft Corp., Manchester, Georgia.

ARGO: Sale or trade. Complete recovering, Hamilton propeller, new tires, licensed, motor overhauled, 225 hours; Warrior 115 h.p. Priced to sell. William Herr, Prospect, Ohio.

HISSO TRAVEL AIR: Licensed, excellent condition, total time 475 hours· new propeller, brakes, extra motor; $950. Accept car for part. Robert Moffitt, Muncie Airport, Muncie, Indiana.

PITCAIRN Sport Mailwing: New J-5 motor; double instruments; bank and turn, rate of climb, flares, landing lights, cockpit heater, tail wheel. Charter Flying Service, 1813 Avenue N, Brooklyn, New York.

FOKKER SU: Best Wasp in country; two brand new full airwheels; generator, electric starter, radio; plenty instruments; ship just refinished. Beautiful job; relicensed to May 1935. Make offer. Joe Gore, Shushan Airport, New Orleans, La.

STINSON SM8A: Lycoming. 400 hours. Fuselage unlicenseable due to defective tubing. Ship otherwise O.K. Accept best offer over $700. Want Warner 110 in good condition. AERO DIGEST, Box 1782.

PRIVATEER AMPHIBION: Two-place open cockpit monoplane. Warner-powered, pusher, steel propeller. Total flying time, 392 hours. Ship completely overhauled at 310 hours. Always maintained by owner's mechanic. Excellent condition and ready to fly away. Price $1,600 cash, no discounts or trades. Robert D. Huntington, 521 Fifth Avenue, New York, N. Y.

WANTA BUY A DUCK? Savoia three-place, Kinner B-5, 125 stallions. Plane, hull and motor A-1 condition, has new prop, and semi-airwheels. 210 hours total time and licensed to April 15, 1935. Always privately owned, never cracked. Interested only in best cash offer over $1,900. AERO DIGEST, Box 1783.

WACO F, Stinson, Moth, Taperwing, Curtiss Jr., Challenger Command-Aire, Robin, OX Bird; privately owned airplanes. Hundreds of satisfied customers bought their airplanes through Pioneer Aviation Co., c/o Airport, Syracuse, New York.

NEW STANDARD: Licensed to November first. 25 hours since major on J-5. Price $1,500. Wanted: Taylor Cub, Aeronca, floats—3400 gross. Jack Alrutz, Airport, Schenectady, New York.

J-5 STEARMAN: $1,350. Excellent condition. Townend ring, oversize tires. Or will trade for Kinner Bird in good condition. Steve Reich, Hangar 25, Roosevelt Field, Mineola, New York.

CURTISS ROBIN OX-5: In good shape. Motor turns 1450 on chocks. Identified; can be licensed. $295. Will trade. Stephen Petrovic, 150 Brahm St., Pittsburgh, Pennsylvania.

MONOCOUPE: Lambert, with starter, speed ring, steel prop, rate of climb, turn and bank, special clock. Controls chromium plated. New type landing gear, pants, navigation lights. Motor 30 hours since factory rebuilt. Ship positively new condition throughout. Price, $1,575. Would consider good Fairchild 22 or Great Lakes part payment. Bob Horsfield, 300 East Second, Topeka, Kansas.

PARKS P-2: Axelson-powered, 3 POLB, just refinished black and silver, new windshields and control wires. Engine given complete check, minor repairs and adjustments. $775 cash, or will accept a trade with cash difference. Bald Eagle Airways, Lock Haven, Pennsylvania.

STINSON WASP: 50 hours since factory recover, refinish; engine overhaul. Engine and ship very clean. Seven-place; cruises 115. W. Cameron, Pettibone, LaCrosse, Wisconsin.

AMERICAN CIRRUS Upright motor: Prop, hub; new. Take Ford coupe in trade or good OX licensed job; or $350 cash. 121 S. Dickerson Ave., Detroit, Michigan.

1933 STINSON RELIANT: 107 hours total time; special cream, blue paint; red leather upholstery; landing lights, flares; turn and bank, rate of climb; Lear radio. First and last price, $3,850; no trades or terms. Located at Curtiss-Reynolds, Chicago. Address: John Porter, 630 Greenbay Road, Lake Forest, Illinois.

TAYLOR CUB: Just recovered, finished in cream and red. Engine completely overhauled 350 hours, no time since. Never cracked. Take damaged ships or one needing repairs, in trade. Price $850. Aero-Ways, Inc., Cleveland Airport, Cleveland, Ohio.

FOR SALE: J-5 Stearman, $1,250. Lambert Monocoupe, $1,200. Challenger Travel Air, $1,150. Warner Aristocrat, $900. Aero Brokerage Service of N. Y., Roosevelt Field, Mineola, New York.

FOR SALE: Monoplane 2-J6-9. Speed 160, 20,000 feet 30 minutes; 100 hours. Excellent for photographing or club. Advertising. Dan La Lee, 5745 Middlesex Ave., East Dearborn, Michigan.

WACO J-5: Just overhauled and recovered; Great Lakes; Fleet; Aeronca C-3 and C-2; OX-5 Swallow. All ships licensed and in first class condition. Air Activities Airport, West Chicago, Illinois.

STEARMAN: Wright 300 h.p. motor; less than 200 hours on ship; beautiful two-tone blue, gold, silver paint. Complete instruments, two parachutes; 110 gallon tanks. Ship and motor perfect. Price $2,550 cash. Address: John Porter, 630 South Greenbay Road, Lake Forest, Illinois.

FOKKER STANDARD Universal: J-6 300. 7-place. 350 hours total time. Never cracked, always hangared. Pants, ring. Absolutely perfect, $3,000. Will consider Taperwing Waco, Stearman or Pitcairn. Balance cash. AERO DIGEST, Box 1787.

TRAVEL AIR 2000: OX-5, excellent, licensed December 1934; Millerized exhaust, oil heater on motor, oversize wheels and tires, motor rebuilt completely 70 hours back; a steal at $410, or will trade on J-5 Travel Air. Northern Air Service, Airport, Duluth, Minnesota.

SZEKELY FLYABOUT: Few hours, licensed, practically new, excellent condition, never cracked. New extra prop; other extras. $500 cash, flyaway. J. E. Mutchler, Miles City, Montana.

SIX-PLACE BUHL Airsedan: J-6 330, 180 hours on motor since new, wonderful condition. Eight-place Buhl, practically new Cyclone, only 21 hours since new. Simplex midwing, new, never flown, less motor. Bull Pup, factory demonstrator, 75 hours on motor. New Szekely motors in crates, $300. Cirrus inverted motor, only 12 hours since new, $400. Cirrus supercharged inverted motor, complete with racing propeller, only 16 hours since new, $500. Fly in; we are only one block from City Airport. Sun Aero Motors & Supplies, 10529 Gratiot, Detroit, Michigan.

WACO F-2: Continental 165 horsepower. Privately owned. Just relicensed. Starter, wheel pants, extra instruments. Will accept trade or sell, $2,250. Total time, 300 hours. J. Loesing, 206 Martense Street, Brooklyn, New York.

Wanted To Buy Or Trade

WANTED: Monocoupe 90, Cavalier or similar two-place airplane. Must be licensed, fully equipped, nearly new, no crack-ups. Give full details first letter. Will pay cash for bargain. W. W. Lynn, Sparta, Illinois.

WANTED: Curtiss-Wright Junior or similar two-place ship in good condition, priced reasonably. Describe motor and ship fully. Write Harold Plocher, North Baltimore, Ohio.

WANTED: The best plane bargain under $1,500. Give full particulars plane and motor. Send photo of ship if one handy. W. V. Spahr, Minneola, Kansas.

WILL TRADE 1930 Stutz sedan, same as new, for Challenger Robin or what have you? A. J. Hartman, care Airport, Burlington, Iowa.

WANTED: Licensed Arrow Sport 90, in good condition, cheap for cash; also 22 x 10 or 25 x 11 air wheels. Superior Flying Service, Ontonagon, Mich.

WANTED: Lower wings for Hisso Waco or Waco Ten. Also need complete landing gear and other parts for Hisso Waco. Earl Bawden, Borderland, West Virginia.

WANTED: Two J-5 Stearmans: 1 Hamilton prop for J-5. **FOR SALE:** One Kinner Fleet, new cover; latest type Kinner. Or will trade for J-5 Stearman. Greer Flying Service, Clarksdale, Miss.

WANT C3B Stearman upper wings, center section, c.s. wires, rudder; or any ribs or parts to same. Any condition. AERO DIGEST, Box 1770.

Wanted To Buy Or Trade

PONTOONS WANTED for 1933 Waco Cabin; also extra tail surfaces. Must be in good condition. W. B. Harding, Holmdel, New Jersey.

WANTED: Left rear spar, ribs, motor mounting board for Curtiss Junior. For sale: 24 x 3 wheels, tires; Heath B-4 motor, 70 hours. Make offer. John Tripp, Box 656, Marquette, Michigan.

WANTED: The best open or closed job $1,000 cash will buy. State all particulars in first letter. AERO DIGEST, Box 1773.

WILL PAY CASH for Stinson Jr., also OX Travel Air. Would consider OX Waco or OX Bird. Give complete history and condition. R. E. Searle, Ogallala, Nebraska.

WANTED TO BUY for cash: J6-5 Robin or similar ship. Will not pay over $1,000. State condition and lowest price first letter. E. C. Geary, LaPlant, South Dakota.

HAVE CASH for Ryan J-5 or J-6 cabin ship, in any condition, with or without motor. State full details in first letter. AERO DIGEST, Box 1776.

WILL TRADE: 1932 Chevrolet coupe, like new, low mileage. Want open or cabin ship. Will pay some cash. Give full details in first letter. Floyd Becker, Grand Rapids, Michigan.

WANTED: For cash, airplane, any condition that can be repaired and licensed, less engine. Must be East of Mississippi. Give complete details and lowest cash price. AERO DIGEST, Box 1777.

WANTED: Warner and Lambert Monocoupes, Warner and J6-7 Cessnas and all models Waco planes. Description, photo and price in first letter. AERO DIGEST, Box 1778.

WANTED: Airplane in good condition, reasonable; must be willing to accept piece of improved property as part payment; balance, cash. AERO DIGEST, Box 1781.

WANTED: Stinson parts. Model SM8A, right landing gear, low pressure; right rear wing strut; stabilizer strut. E. M. S. Flying Service, Watson Airport, Blue Ash, Ohio.

HAVE UP to $2,000 cash for best value in Stinson, Jr. Advise hours, covering, upholstery, instruments, undercarriage, history. Only bargains considered. AERO DIGEST, Box 1786.

WANTED: Good air-cooled ship or good OX-powered job. Vic Johansen, care United Air Services, Floyd Bennett Field, Brooklyn, New York.

WILL TRADE very fine lady's diamond ring, value $2,950, for plane; preferably Waco F, F-2, C or Stinson. Reply fully AERO DIGEST, Box 1785.

WANTED FOR CASH: Menasco 6, Warner or Lambert. State time and condition. Dan La Lee, 5745 Middlesex Avenue, East Dearborn, Michigan.

NEW OR USED 1933 or 34 Chevrolet . . . will trade for 2-place Aeronca. Sidles Airways Corporation, Union Airport, Lincoln, Nebraska.

WANTED: Two Ryan B-5's. State price and condition first letter. Also: Damaged planes to rebuild and sell for owners. Write for details. New Eaglerocks and Flyabouts at sacrifice prices. Aircraft Mechanics, Inc., Colorado Springs, Colorado.

WANTED: Waco F, Monocoupe, Bird or 4-place cabin ship. Would consider crack-up. Will pay cash for right price. Post Office Box 94, Port Huron, Michigan.

Positions Wanted

PRIVATE PILOT with enough time for L. C. Experienced on engines and aircraft. Willing to work for flying time and board. Free to travel. Norman A. Hartman, 17 Norman Avenue, Trenton, New Jersey.

TRANSPORT PILOT: Naval aviator; thoroughly familiar with blind flying and night flying; 725 hours; married; age 27; 2½ years aeronautical engineering. Wants flying job. AERO DIGEST, Box 1767.

TRANSPORT PILOT: Young single. Blind, night and beam flying. Experience on all types. Good references. Consider anything.. AERO DIGEST, Box 1788.

TRANSPORT PILOT: Age 22, single, 550 hours. night flying and barnstorming experience. Excellent references. Will do anything and go anywhere. Salary secondary. AERO DIGEST, Box 1771.

Parachutes For Sale

PARACHUTES: Approved type. Seat, back, lap and chest; bought and sold; exchanged, repaired. Tell all first letter. Professional parachute jumpers and balloonists furnished for all occasions. Thompson Brothers Balloon and Parachute Co., Aurora, Illinois. Established 1903.

SACRIFICE: $75. Irvin 24-foot seat pack, pongee silk, zipper case, practically brand new, never used; exceptional buy; private owner. 89 Villa, Buffalo. New York.

Miscellaneous Services Opportunities, Offers, etc.

RADIO ENGINEERING: Broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodges's Institute, Allen Street, Valparaiso, Indiana.

PATENTS: Small ideas may have large commercial possibilities. Write immediately for information on how to proceed and "Record of Invention" form. Delays are dangerous in patent matters. Clarence A. O'Brien, 3141 Adams Building, Washington, D. C.

AIRPLANE TOW BANNERS with scientifically built detachable letters. 1934 prices and terms. Discount to dealers. Your chance to make more money. Light plane banners. R. V. Trader, Mfg., Dravosburg, Pennsylvania.

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FOR RENT: 100-foot hangar; concrete floors, with office, engine and plane repair shops. Real business opportunity. Popular Airport-Dycer Flying Service, Inc., 9401 So. Western Ave., Los Angeles, California.

OPPORTUNITY TO purchase complete Transport Course, $600 less original cost, for cash. Large school. Best equipment. Inquire immediately. Leroy Levis, Rockfall R.F.D., Connecticut.

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LEARN TO SOLO for $90. Pay by the hour. Modern equipment. Transport pilots teach you. It's a bargain, boys! Let's get acquainted. Call Newtown 9-2867 from 6 to 7 p.m. Write D. Franklin, 37-52 89th Street, Jackson Heights, N. Y.

HAVE ADVANCED hydroplane design, practical, good commercial possibilities. May be further developed. Want to sell. Have other unpatented inventions for sale. AERO DIGEST, Box 1784.

COMMERCIAL AIRPORT: 35 miles from Philadelphia on main highway. Hangar and 8-room stone house on property. Priced reasonably and well worth investigating. For particulars, write to Frank J. Mayer, Pennsburg, Pennsylvania.

DRIGGS SKYLARK PLANT complete, including one finished airplane, machinery, stock of parts and government approved blueprints of the Skylark, ready to start manufacturing. Will sacrifice. B. H. Seydel, 342 Paris Avenue, Grand Rapids, Michigan.

AIRPORT for ren or sale: M-21; Flint, Michigan. 2½ miles from Flint on paved highway. Ideal place for a School. Mrs. Elizabeth Kelley, Flint, Mich., R. D. 1.

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Miscellaneous Products & Equipment For Sale

EDO FLOATS, size 2665, with rudders. J6-7, total time 450 hours, no time since government overhaul, $500. Landing gear, wheels and brakes for Straight Wing Waco. Pen Edgar, 246 Grant Avenue, Nutley, New Jersey.

TANK MOTOR: Model 63, 5 hours, $350. Szekely 45, $165. J6-5, $425. LeBlond, $150. Used airplane parts, all makes. Pioneer Aircraft Supply, Airport, Syracuse, New York.

WINGS: 1 right Robin wing, new with gas tank, no crating charges. 1 left lower Fledgling panel, like new. Will accept reasonable cash offer. Box 1118, Raleigh, North Carolina.

GOOD PARACHUTES: Bank and turns, other instruments. Camera. Adjustable pitch propellers, 90-450 h.p. New wood props, 60-220 h.p., $20. Cyclone inertias; J-5, Lycoming, electric starters. All American Eagle parts. Travel Air 4000 wings. FC-2 parts. LeBlond 60 and Klemm mount. OX American Eagle, terms. AERO DIGEST, Box 1769.

LATE TYPE WASP "C": Eight-surface spline clutch, heavy cam gears, etc. Priced to sell. "B" and "C" Wasp parts, 85% off list. 9-cylinder Heywood starter complete, $65. R. Mossman, 6230 So. Claremont, Chicago.

SCINTILLA MAGNETOS, P N 3 and 5, F1, new, $10 each. Stromberg carburetors, R-3, new, $10 each. 300 h.p. Model H Hisso, original crates, $150, f.o.b. Philadelphia. Burholme Motors, Rising Sun Ave. and Cottman St., Philadelphia, Pennsylvania.

PROPELLER PRICES REDUCED: Brand new late production Hamilton wood props, any size, $15. Marshall, Bennett and Flottorp propellers for all motors. Central Air Service, Grand Rapids, Michigan.

FIVE AND SEVEN cylinder Heywood starters; exhaust collector rings for Jacobs, Continental; J6-9, Kinner; pair J-5 blades; new 15v.-15a. generator; NAR-3 and 9 Stromberg carburetors; pair Switlik exhibition parachutes; large and small size Pioneer bank and turns; new pair 22 x 10-4 wheel pants; speed rings for Jacobs. Basil Aviation Co., Philadelphia Municipal Airport, Philadelphia, Pennsylvania.

TWO WRIGHT Gipsy cylinders. Electric starter F-141, $55. NAR-3 carburetor, $20. J-5 cylinders, 9 for $90. 7-cylinder Heywood starter, reconditioned, $75. D H Gipsy heads, new guides and seats, $25. Kinner 210, needing top overhaul, $300. AERO DIGEST, Box 1779.

WINGS: Used and rebuilt for Waco 10, Waco cabin, Travel Air, American Eagle; many others. Wanted: wrecked or used wings. For sale: Spars, ribs. New London Aircraft, New London, Ohio.

HEATH LIGHTPLANE Edo floats 2650, $60. Henderson motor with propeller for lightplane or boat use. Sell or trade. Chris Walton, 2830 Morgan, Tampa, Florida.

WACO F; Bird; Travel Air; Monocoupe wings, parts. Want airplanes, parts for cash. J-5, Kinners. Eaglerock lower right panel, aileron. Waco parts. 6.50 x 10 semi-air tires, practically new, $25. Bird OX-5, $650. Eaglerock $275. Crane Garage, Toledo, Ohio.

J6-5, J6-9, Menasco 260 h. p.; Monocoupe wing, fuselage, struts, tail unit. Damaged Szekely. Stinson SM8A wings, landing lights, magnetos, OX steel propeller. Travel Air motor mount (J6-5), cowling, center section, ailerons. Bargains, Box 1457, Tampa, Florida.

ENGINES AND PARTS: Tubing 2000 ft. ⅜", ½", ⅝" 1025, 10c per foot. Tubing 2500 ft. ¾", 2" 4130 chrome, 15c per foot. Air wheels, 16 x 7-3, $25. Tires, 10-26 x 4, $3.50 each. Instruments, turnbuckles, etc. Velie motor, 30 hours, $125. OX-5, $20. Send for complete list. Douglas Harris, Waverley, Iowa.

BENDIX WHEELS, 30 x 5, no dents, $18 pair; new 30 x 5 tires, $4.50 each. We have a few pairs of airwheels left. New 950 x 12 tires, $20 each; new 1100 x 12 tires, $30 each. Berry Bros. No. 887 clear dope, 5 gal. $6, 30 to 50 gal. $1.05 per gallon. Grade A fabric, 32c yd., 18 x 3 wheels, complete with tires and tubes, $15 pair. Brand new Consolidated type N tachometers, $10 each; brand new Consolidated altimeters in original package, $8 each. Turnbuckles, 10c. each; 19-strand aircraft stay cable, $10 per thousand ft. spool. Rate of climb indicators, $55 each. Turn and bank indicators, $45 each. The biggest supply of genuine Szekely parts in the country; Scintilla magneto parts. Write for our list; it is now ready; a slew of bargains. Sun Aero Motors & Supplies, 10529 Gratiot Avenue, Detroit, Michigan.

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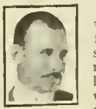
VITAL FOR SAFE FLIGHT

Airplane Mechanics' Rigging Handbook

by **R. S. Hartz,** *formerly Lieut. Colonel, Air Corps, U. S. Army; and* **Lieut. E. E. Hall,** *formerly Editor, Aircraft Servicing. 105 illustrations.* **$3.50.**



It is even more important for an airplane to be perfectly rigged than for its engine to work perfectly. Dead-stick landings are commonplace, but no plane can land safely with a collapsed interplane strut or minus one wing. Every licensed airplane mechanic and every mechanic's helper will have daily, on-the-job use for this collection of tested and approved directions. As a manual of operating procedure, it is needed by every pilot and airport service man.

This book tells you how to get an airplane into safe flying condition and how to keep it that way. It is written in plain language, without mathematics, that anyone can easily understand. The instructions are given in great detail, explaining how each operation should be done, in what order, and the reasons why. Just as useful are the many don'ts warning the rigger not to do the wrong thing. The book deals fully with handling planes on the ground and in the shop; how to true up the assembled ship; how to adjust the wings and control surfaces for "hands off" flying; the materials for patching, splicing, and repairing of all kinds: practical hints for riggers; installing and correcting compasses; methods of plane inspection.

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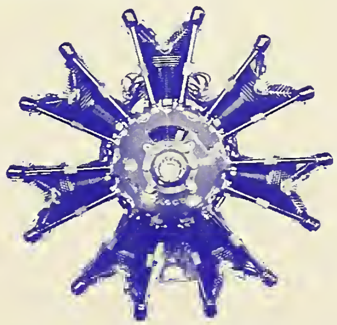

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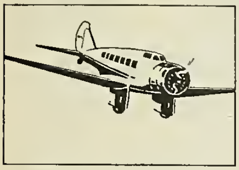
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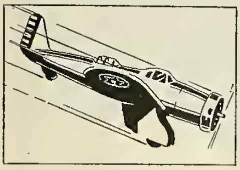
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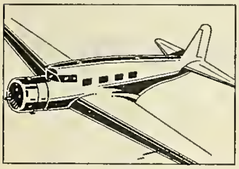
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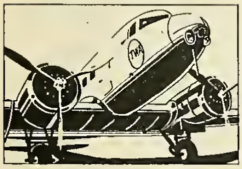
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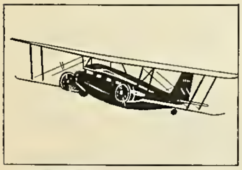
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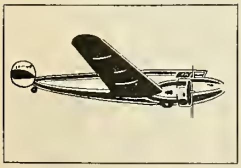
Lockheed Electras for Pan-American are built near the school.

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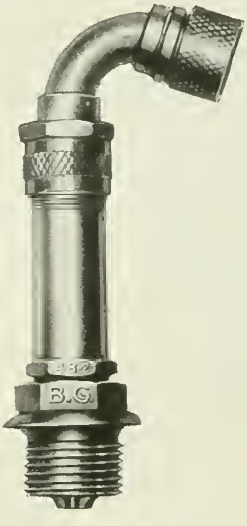

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TRAINING duty service—hours of continual take-offs and landings—demands the utmost from airplane equipment. Tires must be built safe with the ability to cushion shocks and withstand the abuses when the student fails to set down the ship correctly. They must have the stamina to withstand the jolts of landing fields that aren't well ironed out.

Firestone Low Pressure Airplane Tires are standard equipment on the popular "Fleet Trainer"—built by Consolidated Aircraft Corporation, Buffalo, New York. Their many satisfied users know the cushioned safety and long, dependable service that is built in Firestone Low Pressure Airplane Tires. They don't know why, but tire engineers will tell you that only through Gum-Dipping the High Stretch Cotton Cords do you get the extra resiliency and strength needed for safe, smooth landings—and only Firestone Tires are built with Gum-Dipped High Stretch Cords.

Order your next ship on Firestones—or write to the Firestone Tire & Rubber Co., Akron, Ohio—Los Angeles, Calif., for complete information and prices.

» *See Firestone Air Balloon Tires made at the Firestone Factory and Exhibition Building "A Century of Progress." Chicago* «

Firestone

LOW PRESSURE AIRPLANE TIRES

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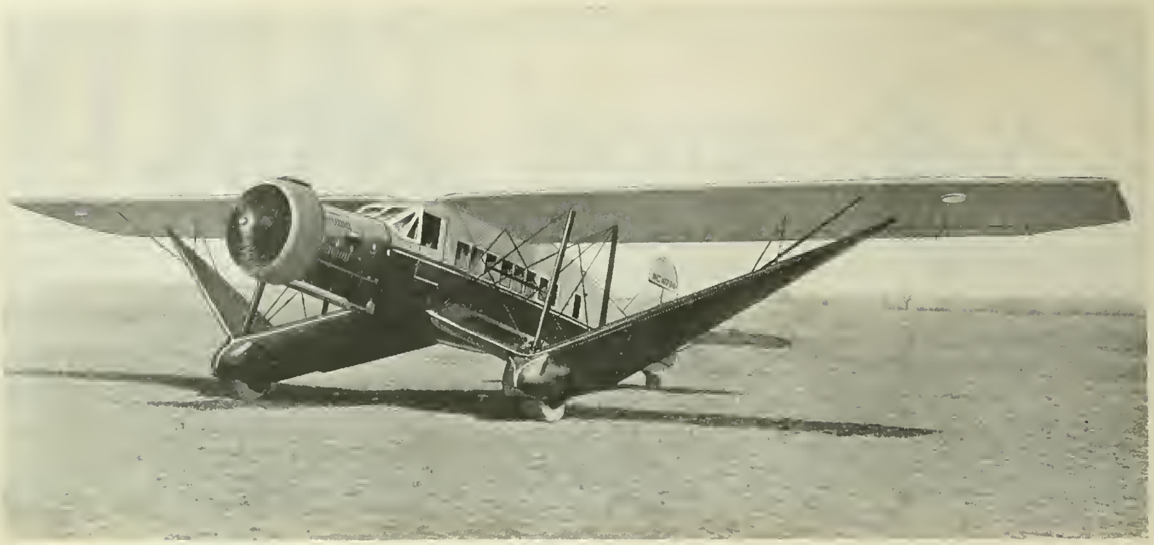

Equipped for transport service, the Aircruiser comfortably accommodates twelve to fifteen passengers and 1000 pounds of baggage.

The BELLANCA AIRCRUISER

★ ***A superior combination of efficient design and long experience in the construction of large capacity*** ★

AIRCRAFT

BELLANCA airplanes have filled countless pages of aviation history with records of outstanding achievements, each of which has represented a distinct advancement to aeronautical science. The introduction and development of the closed cabin plane—the greatly increased lifting efficiency of the Bellanca wing—endurance and long distance flight records—efficiency contest victories—seven crossings of the Atlantic and the only West-East crossing of the Pacific,—non-stop 4500 miles—each achievement establishing standards by which subsequent airplane performance was measured.

The Aircruiser, embodying all of the superior characteristics of Bellanca design and construction, is built to carry a tremendous useful load—4920 pounds—10c. per ton mile cost—at speeds in excess of 2½ miles per minute. It offers the extremely low operating and maintenance costs of single engine performance and the typical, dependable stability of Bellanca designed aircraft.

As the result of exhaustive tests, Bellanca ships have been purchased and are being flown regularly by the United States Army and Navy, by the Canadian and Brazilian Governments and by a number of airline companies to whom their Bellancas' low operating costs and large payloads mean profit.

Specifications and actual performance data are interesting; write for them today.

BELLANCA AIRCRAFT CORPORATION · NEW CASTLE, DELAWARE

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BELLANCA

· NAVIGATION COMPASSES · NAVY STANDARD COMPASSES · SENSITIVE ALTIMETERS ·

ICE WARNING INDICATORS · LEVEL FLIGHT INDICATORS · COMPASSES ·

ALTIMETERS · OIL, WATER, AND CABIN THERMOMETERS · ENGINE GAGE UNIT

The Kollsman Instrument Mounting. For flush mounting from front of panel. The instrument fastens quickly in place by the turn of one screw.

Actual unretauched photograph showing instrument illuminated for night flying by Kollsman individual, self-contained lighting.

· TACHOMETERS · MANIFOLD PRESSURE GAGES · FUEL QUANTITY GAGE · AIR SPEED INDICATORS ·

Kollsman announces two important advances in aircraft instruments—(1) individual self-contained lighting for night flying, and (2) new mounting for quick installation of instrument.

The lighting arrangement consists of a small electric lamp located at the center of the cover glass which illuminates pointers and dial uniformly, without glare or stray light. Bulb and glass are replaceable from the front of the panel. A rheostat switch varies the intensity of light. Snap connectors on the back of the case permit quick wiring. A double panel is not necessary, and the instrument dial is therefore fully visible from any practical angle. The lighting system requires no shielding. It does not cause radio interference, nor will it disturb magnetic compasses.

The instruments are quickly mounted flush with the panel from the front by the turn of a single screw. Together with their mounting collar, they are interchangeable with standard lug-mounted instruments.

Replacing instruments in service is accomplished in a fraction of the time necessary for lug-mounted instruments, appreciably shortening the time during which the airplane is out of commission—a particularly important consideration with scheduled and military flying. Because of greatly reduced handling, the instruments are less liable to damage, and the cost of maintenance is lowered.

Standard instruments, including those of other manufacture, can be equipped with Kollsman individual lighting and Kollsman quick mounting. Write for the Kollsman catalog.

[*The complete new line of Kollsman Instruments is being demonstrated in the Kollsman plane which is now touring the country*]

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PRECISION AIRCRAFT INSTRUMENTS

KOLLSMAN INSTRUMENT COMPANY
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Now Headquarters for 2120 Miles of Air Mail Service in Texas

TRAIN WHERE THE MAIL IS ACTUALLY CARRIED!

AT THE SCHOOL THAT **DOES THINGS** FOR ITS STUDENTS

Air mail contracts awarded to Long and Harman, proprietors of Dallas Aviation School and Air College, make this the only aviation school organization in the U. S. which is also flying the mail.

Talk about ACTUAL training conditions—present day equipment—close contact with new developments! Our boys have EVERYTHING.

This school is going places and doing things. We were the first school to abolish old war-time ships and motors—and we have been leading ever since.

Largest Enrollment In Our History

These are big busy days at D. A. S. Aviation is on the boom! The Government is behind the "little fellow." Our student enrollment is now the largest in all the years of our history.

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Come and get into this activity! Learn to fly—under safe and sane instruction—where everything is in your favor. Every day is full of NEW EXPERIENCES here at Love Field. Our students are learning aviation with a bang—and having a wonderful time doing it.

What We Say It Is—It Is We Never Misrepresent

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Love Field—One of the Nation's Best Airports. Cost One Million Dollars.
We Own More Than Twenty Modern Aircraft.
30 Air-Cooled Motors.
Our Investment — Over $200,000 In Equipment.
The Land of Sunshine and Good Flying Weather.
Ask Anyone Who Knows About Us.
We Own Our Own Dormitories and Cafe.
Less Flying Hazards Than at Other Schools.
Complete Machine, Motor and Aircraft Shops.
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Dallas—Over 300,000 Population.
Bus Transportation All Hours of Day to City—10c Fare.
A Strictly Up-to-Date Government-Approved Aviation School.

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Extended to July 15th

Because many young fellows have delayed enrolling with us until learning that we had been awarded the Government Mail contract, we are extending the time limit on our NRA coupons until July 15th. This coupon offer means many dollars of saving for you, no matter what course you choose. See price list below.

COURSE PRICES

With NRA Coupon Allowances

Transport Pilots Course	$1,795
Less NRA coupon saving	150
Limited Commercial Pilots Course	595
Less NRA coupon saving	75
Private Pilots Course	545
Less NRA coupon saving	50
Amateur Pilots Course	350
Less NRA coupon saving	25
Combined Limited Commercial & Master Mechanics Course	795
Less NRA coupon saving	100
Combined Private Pilots & Master Mechanics Course	745
Less NRA coupon saving	75
Combined Amateur Pilot & Master Mechanics Course	650
Less NRA coupon saving	50
Combined Solo Pilot & Master Mechanics Course	495
Less NRA coupon saving	50
Master Mechanics Course	300
Less NRA coupon saving	25

5% ADDITIONAL from the above prices for payment in full at time of enrollment.

FREE! The full amount of railroad fare from your home to Dallas when you enroll for Transport Course. One-half your fare when you enroll for any other course.

WRITE TODAY

for our new circular and 1934 Catalog, and NRA coupons.

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Gentlemen: Send information on the courses checked:

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DALLAS AVIATION SCHOOL AND AIR COLLEGE

Major W. F. (Bill) LONG, Pres.
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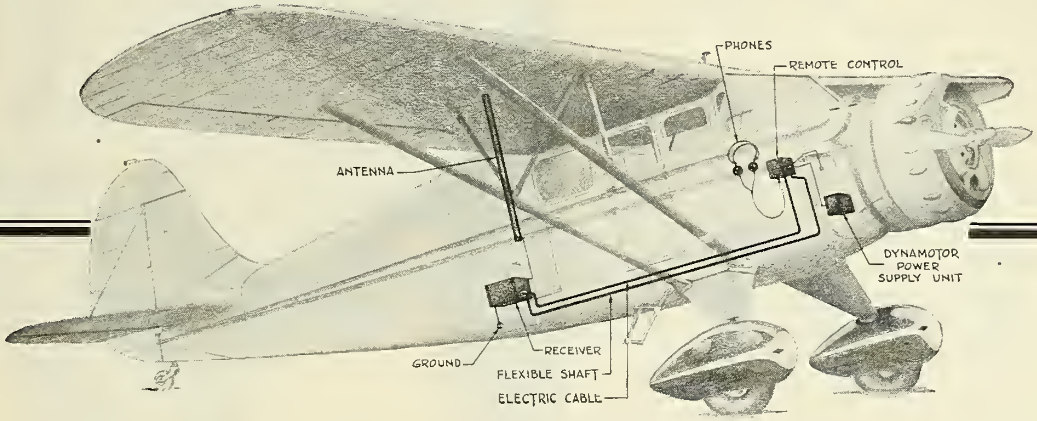
LOVE FIELD
DALLAS, TEXAS

RCA VICTOR AIRCRAFT RADIOBEACON RECEIVER AVR-2



THE newest — highly sensitive — highly selective — Radiobeacon Receiver. A SUPERHETERODYNE designed and manufactured at "Radio Headquarters" — by RCA Victor. Small and light, applicable to any aircraft, large or small — for remote or local control installation.

Dynamotor power supply unit supplies all required voltages direct from aircraft 12- or 6-volt storage battery, assuring carefree operation. Uses no dry batteries.

The RCA Victor Radiobeacon Receiver comes COMPLETE — ready for installation — all cables cut and fitted, with all mounts provided — with tubes and headphones. The installation is very simple and inexpensive.

This receiver will insure complete coverage of all airways radio stations providing constant weather information and radiobeacon guidance. It also provides reception of the many airport radio traffic control stations so necessary to safe landings during poor visibility. Invaluable to instrument flight — and most desirable on all cross country flying.

For any aviation radio requirements, consult RCA VICTOR — *or for information or demonstration, communicate with* AIR ASSOCIATES, INC.

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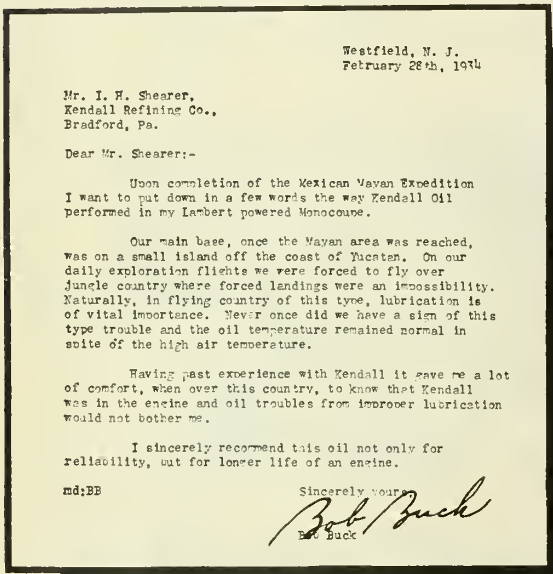
RCA VICTOR

RCA VICTOR COMPANY, INC.
Camden, N. J. *"Radio Headquarters"*

"Kendall Oil Lubricated my Engine perfectly...

over Desert, Mountain, Jungle and Water..."



Westfield, N. J.
February 28th, 1934

Mr. I. H. Shearer,
Kendall Refining Co.,
Bradford, Pa.

Dear Mr. Shearer:-

Upon completion of the Mexican Mayan Expedition I want to put down in a few words the way Kendall Oil performed in my Lambert powered Monocoupe.

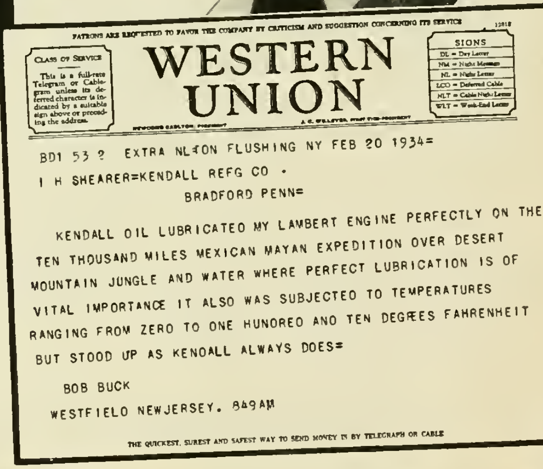
Our main base, once the Mayan area was reached, was on a small island off the coast of Yucatan. On our daily exploration flights we were forced to fly over jungle country where forced landings were an impossibility. Naturally, in flying country of this type, lubrication is of vital importance. Never once did we have a sign of this type trouble and the oil temperature remained normal in spite of the high air temperature.

Having past experience with Kendall it gave me a lot of comfort, when over this country, to know that Kendall was in the engine and oil troubles from improper lubrication would not bother me.

I sincerely recommend this oil not only for reliability, but for longer life of an engine.

md:BB

Sincerely yours,
Bob Buck
Bob Buck



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BRADFORD PENN=

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BOB BUCK
WESTFIELD NEWJERSEY. 849AM

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THUS does Aviator Bob Buck join the thousands of other flyers who have expressed appreciative enthusiasm for the dependable, efficient lubricating ability of Kendall, The 30 Hour Oil. Mr. Buck's Telegram and Letter speak for themselves, telling a story of difficult flying conditions, varying temperatures and the fine performance of Kendall Oil where fine performance was vital.

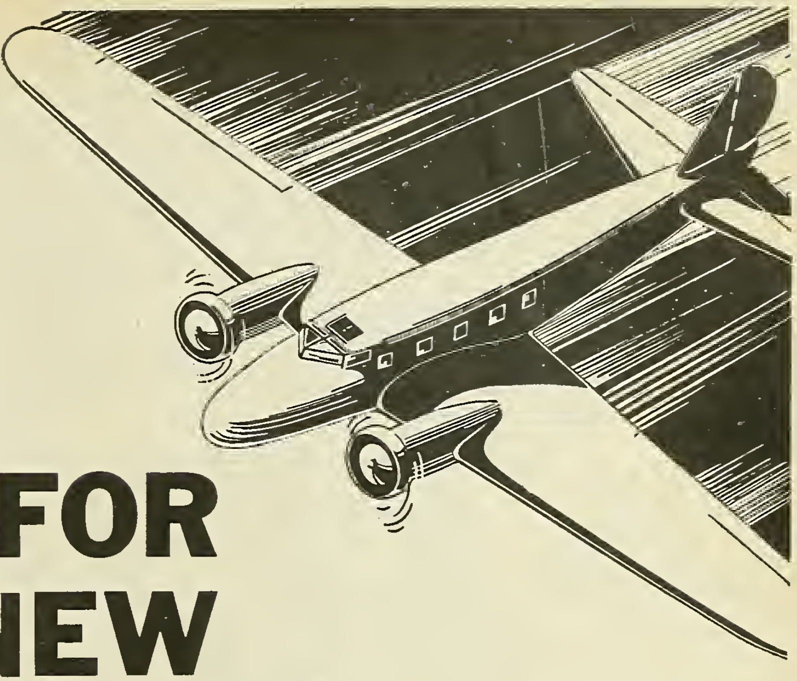
If you use Kendall Oil in the motor of *your* plane, you will find it just as satisfactory as did Mr. Buck. For Kendall is built to give dependable lubrication under all conditions. Refined from the finest crude oil in the world... Bradford Grade of Pennsylvania... by special processes which enhance its quality, Kendall offers a richness, a stamina, a full-bodied lubricating excellence not found in ordinary oils. And best of all, Kendall is extremely economical because each fill is good for more flying hours.

Try Kendall, The 30 Hour Oil, in your plane. It is available at leading airports in refinery-sealed cans which protect it from contamination.

KENDALL REFINING COMPANY · Bradford, Pa.

KENDALL
THE 30 HOUR OIL

MERELY MAINTAIN THE PROPER OIL LEVEL



SEND FOR THE NEW PARKS CATALOG

THE training you receive today will determine your place in aviation two, five and ten years from now. It will determine your entire future. If you are serious about that future—if a good job, promotion, success, mean much to you, think well about these facts:

The entire aviation picture has changed. Parks gives the training aircraft executives demand of the men they employ for important positions. Parks fits men for today's and tomorrow's needs—not yesterday's.

No wonder Parks graduates are working for such leading firms as American Airways, Transcontinental & Western Air, Pan American-Grace, National Air Transport, United Airlines, Lockheed, Curtiss-Wright, Waco, Douglas, Northrop, Glenn L. Martin, Sikorsky, Monocoupe, and many others.

The Parks Executive Transport Pilot's Course is the finest and most complete commercial aviation training it is possible to obtain. The course requires two years to complete, and the man who can afford to devote the time and money necessary should consider none other. It is a small price to pay for the results he will obtain. He will be an outstanding figure.

Parks also offers *shorter* courses—but equally *thorough* in their scope — a Master Mechanics' Flight Course, Airplane and Engine Mechanics, Regular Transport and Aeronautical Engineering —for men interested in these branches of the industry.

The time to strike out is when other men delay. If *you* want to get a job and *succeed* in aviation, write at once for a free copy of "Skyward Ho!", our new 44 page catalog that tells all about Parks Air College, the largest civilian aviation school in the world. Sign the coupon, or write frankly about yourself, and mail today.

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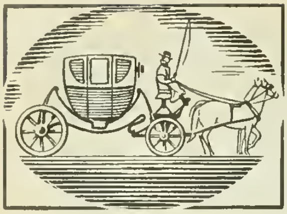
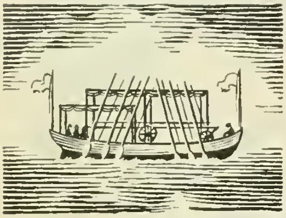
- ☐ Limited Commercial Pilots'
- ☐ Aeronautical Engineering
- ☐ A. & E. Mechanics'



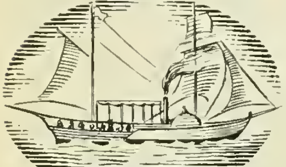
". . . Devil Was Triumphant"

In early days a few of the settlers had the audacity to ride about in brightly colored coaches. There was no objection to riding in a man-carried sedan chair, or to making a journey on foot . . . but a coach! Heaven forbid! It must be of the devil. But, according to an early history, the devil was triumphant.



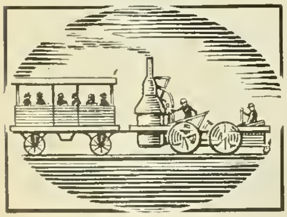
". . . He Is Crazy"

Long before Robert Fulton's steamships appeared, John Fitch was heard to remark: "Steamboats will be preferred to all other means of conveyance." Peter Brown, a shipsmith, glanced at the toe of his rough boot to cover his embarrassment. He held his tongue until John Fitch had gone back to his steamboat; then spoke Peter: "Poor fellow! What a pity he is crazy." Did you say crazy, Peter?



"A Knave and a Fool!"

The first steamboat on the Great Lakes was Robert Fulton's "The Walk-in-the-Water" (1818). Surely by that time the people could see more clearly the future of the steamboat. True, there were some who did; but even then many there were who called Fulton "a knave, a fool and an enthusiast." History agrees that he was an *enthusiast*.

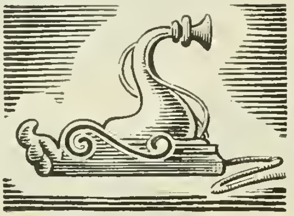


"Unimportant"

When John Stevens presented plans for an overland steam train before the New Jersey legislature in 1811 they refused to consider it on the grounds that they had important matters to consider and the train was decidedly *not* an important matter. Not an important matter, gentlemen? With more than two million square miles of land in your very back yard to be settled?

"My God! It Talks!"

Of course young Alexander Bell's contraption was "impractical". The customers at the Centennial Exposition (1876) didn't take it seriously. But Emperor Don Pedro of Brazil probably wanted to humor the young inventor. Gingerly he put his ear to the device. Smug. Smiling. These North Americans were a little mad, perhaps. But they were interesting. Suddenly the smile disappeared. Consternation! "My God!" exclaimed the Emperor, "It talks!"



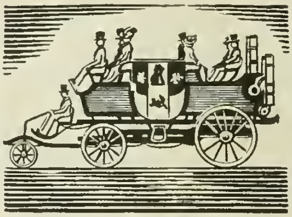
They needed, they had estimated, only eight horsepower. Since [illegible] one could provide it ex[illegible]
in prohibitive weight, they turned to th[illegible]
selves. After six weeks sp[illegible] in rebuildin[illegible]
gasoline engine, they fou[illegible]
horsepow[illegible]
sult they [illegible]
en the [illegible]

Th[illegible]
list [illegible]
ca[illegible]
th[illegible]
w[illegible]
the n[illegible] to
63 pounds.

The propellers [illegible]
genious as the motor, an[illegible]
little help from the outside wor[illegible]
the engine. They didn't expect [illegible]
propellers on the open market [illegible]
almost the first persons who ever wanted such a

Boys Threw Stones

In 1827 Sir Goldsworthy Gurney patented the steam coach—an early forerunner of the automobile. As the steam coach chugged along farmers dug trenches across the roads to impede its progress and small boys threw stones at it. In 1836 the English Parliament passed a law requiring that a man carrying a red flag should walk ahead of a steam coach to warn the people on the road.



The propellers—there were two—were just as in-
ge[illegible] as the motor, and the Wrights got just as
[illegible]tside world as they had with
[illegible]t ex[illegible]d go out and buy
[illegible]co[illegible]. They were
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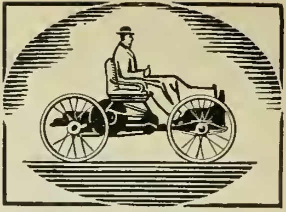
[illegible] to give them some
[illegible] to make an air-screw.
[illegible] discovered there was no
such data.

"Just a Freak"

THAT'S what they said three years ago when Walter Beech announced plans for a luxurious cabin airplane that would travel 200 m.p.h., and could be landed on ordinary airports. "Some day, perhaps; not in our generation." *But the first Beechcraft exceeded that speed.* A few months ago when Mr. Beech announced he would build a 225 h.p., four-place cabin airplane that would travel 170 m.p.h. there was again much head shaking. "It will be just a freak." Again Mr. Beech and his engineers exceeded their estimates. The new 225 h.p. Beechcraft has a guaranteed top speed of 175 m.p.h. History is today repeating itself. The early critics of the Beechcraft are now busy trying to imitate its many SUPERIOR FEATURES! The Beechcraft is out in front . . . *and will stay there!*

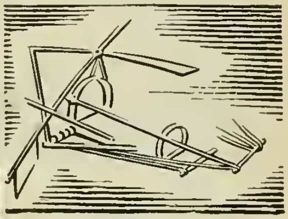
The BEECH AIRCRAFT CO.

WICHITA, KANSAS



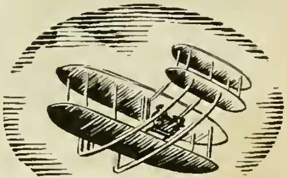
"Better Come Back to the Farm, Son"

Thus did the father of Henry Ford urge his boy who had gone to Detroit and was learning the machinist's trade. Even before Henry Ford went to the city he had fitted up a small machine shop on the farm where, according to his father, he was wasting his time . . . better to raise potatoes and peaches and apples.



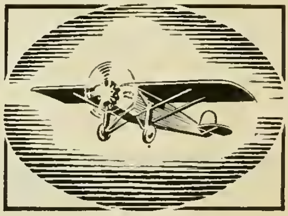
"Witchcraft . . ."

The man who painted the "Mona Lisa" and the "Last Supper" was also a great scientist. Because of his scientific research he was forced at one time to flee an angry mob that whispered in hissing crescendo: "Witchcraft!" If a study of aerodynamics and gliding surfaces was witchcraft, then Leonardo da Vinci should have been burned with the rest of the witches.



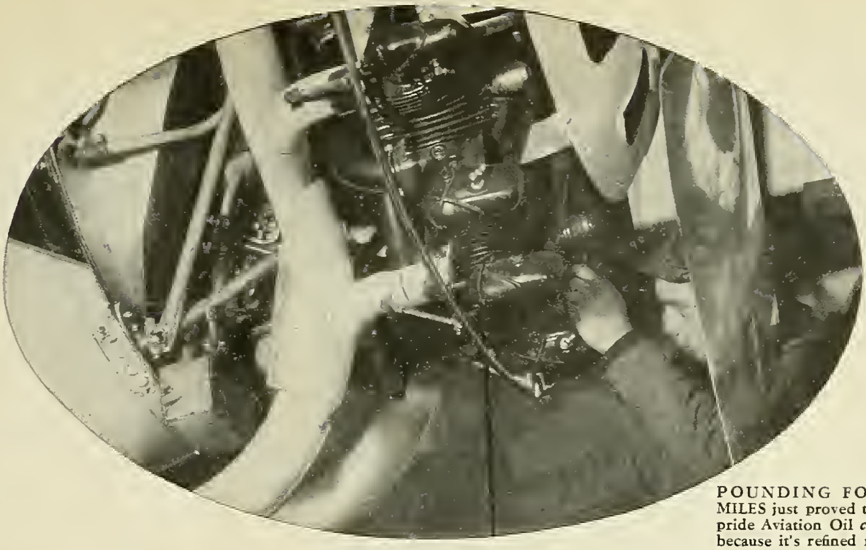
"Both Crazy!"

It was the belief of some of the farmers around Kitty Hawk that the Wright brothers were crazy—"Both crazy!" And yet, there probably never were two brothers who were more sober, level-headed and cautious. The terms "crazy" and "freak" are always quick to appear when someone has the courage to defy conventional beliefs.



"Foolhardy . . ."

That one word was on the lips of millions on the morning of May 29, 1927. A young air mail pilot by the name of Charles Lindbergh took off from Curtiss Field on his way to Paris, that morning. A number of famous aviators were ready to do that very thing . . . had been waiting for favorable conditions, but here this young punk took off all by himself. And thereby brought interest in commercial aviation to a high pitch.



POUNDING FOR 7000 MILES just proved that Gulfpride Aviation Oil *can take it* because it's refined right.

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7000-Mile Air Flight Proves That Gulfpride Can Take It!

YOU can't break it down—because there's no "break" in it. That's Gulfpride Aviation Grade Motor Oil. And the fact was conclusively proved in a 7000-mile flight from Texas to Maine.

Let Pilot R. S. Lee tell his story: "On a 7000-mile trip from South Texas to Maine I used Gulfpride 120 Aviation Grade Motor Oil, flying a Lockheed Vega plane with a 450 H.P. Wasp Motor. Our engine temperatures varied from 80 to 40 C., but the pressure did not vary more than 5 pounds the whole way, usually ranging between 72 and 75."

Do you want all the facts about this trip? And would you like a common sense explanation of aviation lubrication? Then sign the coupon and return it to us.

GULF AVIATION PRODUCTS

GULF

When you mail this coupon you will receive complete information→

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COMES CLEAN—Chief Mechanic Herb Miller, Air Service of Pittsburgh, drains oil after 7000-mile pounding and finds it clean and pure.

TAKES TEST—Mechanic Milton Slater gives Gulfpride the famous Screen Test—and gives both his O.K.

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Douglas Aircraft Company, Inc.. Santa Monica, Cal. ✦ The Northrop Corporation, Inglewood, Cal.

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Texaco Airplane Oil is used consistently by the country's foremost air transport companies. Records have been made with it on these commercial routes and by many famous flyers. ★ Texaco Airplane Oil maintains pressures. Carbon residue is unbelievably low. Use Texaco Aviation Products. See how much better your engine's performance.

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AERO DIGEST

VOLUME TWENTY-FOUR NUMBER SIX

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The tri-motored Stinson Model A Airliner cruising at a speed of 150 miles an hour in a test flight over the city of Detroit, Michigan.

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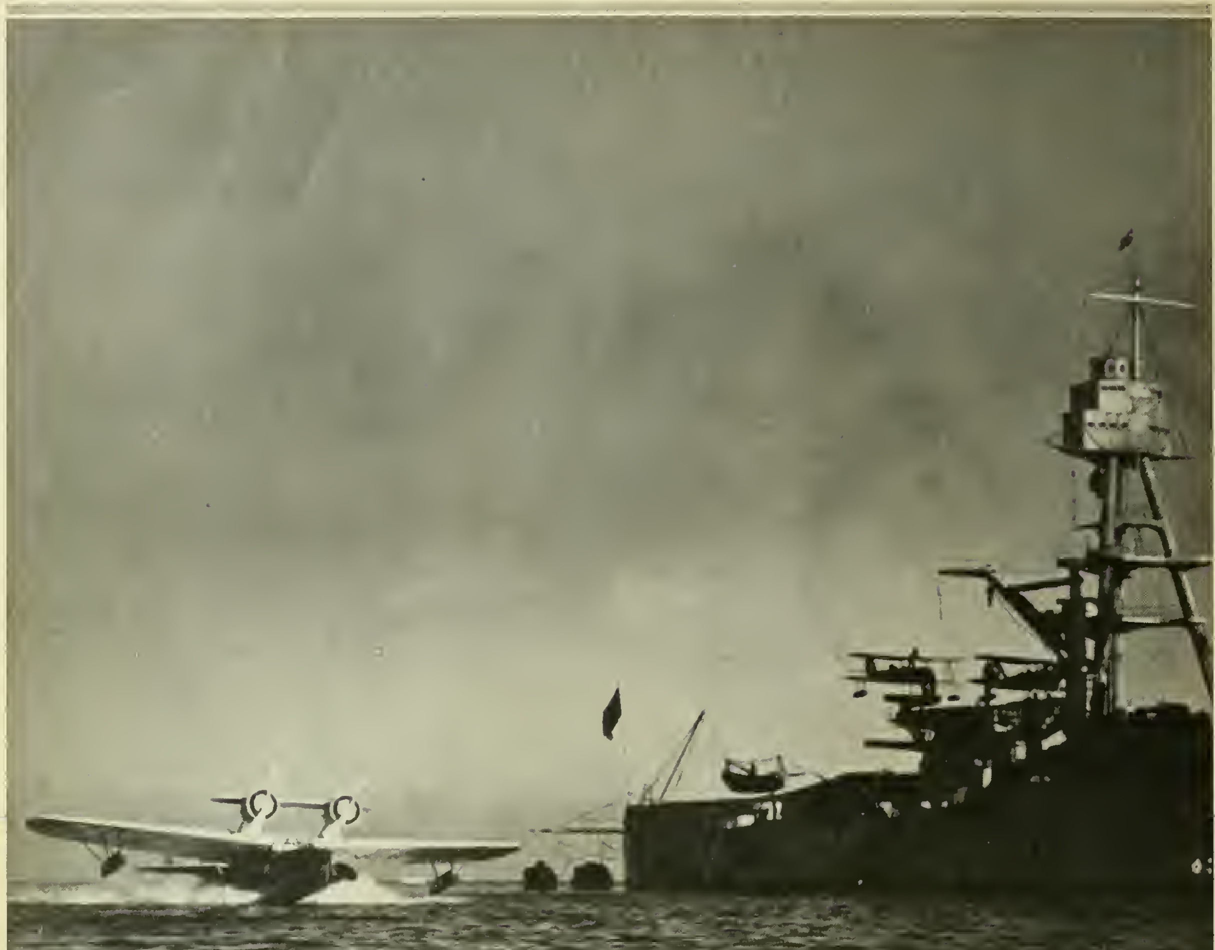


A twin-motored Douglas Dolphin amphibion alighting on the sea
alongside of an airplane-equipped cruiser of the U. S. Navy

The 1934 Langley Field Conference

ALEXANDER KLEMIN
Daniel Guggenheim School of Aeronautics, New York University

● The annual conference of the N. A. C. A. held at Langley Field on May 23rd, proved as instructive and representative as ever, when the Langley Field Staff presented in brief the results of their investigations during the past year, and five informal conferences, covering the main topics of current research, were held simultaneously. There was also an inspection of the many laboratories at the field.

High-Speed Compressibility Effects

The Committee is giving special attention to the compressibility effects of high speed and a 20-inch high-speed tunnel is approaching completion. Propeller tip speed problems at present and stratosphere flights in the future more than justify compressibility research and work in the small jet, high-speed tunnel has already produced one airfoil section (NACA 204) which, with sharper leading edge has less drag than conventional sections at speeds exceeding 400 m.p.h. For a hypothetical airplane of 5,750 pounds gross weight, equipped with a 2,300 horsepower engine, the use of this new section would save 315 horsepower at 544 m.p.h., and increase the top speed from 524 to 544 m.p.h. In the new high-speed tunnel it will be possible to measure the lift as well as the drag of speed sections, although research will be mainly directed to the fundamentals of compressibility effects. In a demonstration of these effects, the compressibility wave was photographed by making use of the fact that the refractive index of compressed air is different from the index of air at atmospheric pressure, so that with a bright source of illumination, the motion of the compressed air wave can be recorded by a high-speed camera. With an airfoil placed at zero lift attitude, a transverse region of compressed air formed at the leading edge and traveled back with the airstream, a phenomenon not yet clearly understood.

Scale Effects

For many years the variable density tunnel was considered the most powerful tool of scale effect research. With the operation of the full scale tunnel, the emphasis is naturally shifted in this laboratory in which no scale corrections are necessary, in which turbulence is slight and in which a Reynolds Number of eight to nine million is available. No matter how high the Reynolds Number is carried the maximum lift coefficient still appears to increase (although slowly) and the minimum drag coefficient to decrease (although very slowly). The work on turbulence and scale effect has been sufficiently dealt with in the December 1933 and January 1934 issues of AERO DIGEST and elsewhere. However, it must be remembered that the excessive turbulence of the variable density tunnel gives the equivalent of too high a Reynolds Number, and to correct for this turbulence effect, the Reynolds Number of a variable density tunnel test is empirically divided by 2.4.

High Lift and Control Devices

In the past, suction boundary layer control has been applied only to very thick wings but in more recent tests narrow suction slots have been applied to the upper surface of a normal wing with depressed rear flap. With the aid of the suction slots for removing the retarded boundary layer, the smooth flow persists on the upper surface no matter how great the angle of incidence. It is understood that at incidences of about 45 deg., burbling on the upper surface of the wing was avoided even with maximum lift coefficient values raised 300 to 40 per cent. The practical problem arises as to how this immense lift coefficient could be utilized without some form of variable incidence wing.

While the work on split flaps during the current year has revealed nothing outstanding, progress has been made in the design of lateral control surfaces for use with a split flap running from root to tip. A narrow conventional aileron placed above the split flap and working only in an upward sense may now be regarded as satisfactory. A retractible aileron (which caused considerable surprise) consists of a curved surface which slides into the interior of the wing when not in use, and appears as an effective "spoiler-aileron" when desired. It is placed about a fifth of the chord from the trailing edge. Spoilers on the upper surface are interesting. If the spoiler is placed far forward, the rolling moment is high, but the lag in action is too severe. When the spoiler is moved far back, the lag disappears but the rolling moment becomes too small. The retractible aileron, constituting merely a sliding surface, has no hinge moments or other resistances to offer the pilot, and fliers pronounce it effective but too light.

One curious lift increase device was a rather large fixed slot running from the lower surface fairly near the leading edge to another opening on the upper surface rather far back. The idea underlying this device was to connect points on the upper and lower surface so that these points in normal flight would be of the same pressure. Thus, normally there would be no flow and no increase in resistance due to the presence of this fixed slot. At high angles of incidence the familiar anti-stall effect was produced. The increase in drag was not very great, but neither was the increase in maximum lift coefficient. The ratio of C_L maximum to C_D minimum was increased some 18%.

Rotary Aircraft

Some members of the Committee's staff are impressed with the high-speed possibilities of the autogiro, for which extensive data have been compiled by tests in the full-scale tunnel. For an autogiro rotor system with 120 r.p.m., 45 ft. diameter, 3,000 lb. weight, 300 horsepower, streamlined cantilever pylon, and retractible landing gear, computations indicated a top speed of 186 miles per hour, retaining the usual landing speed characteristics of the autogiro. The Wilford Gyroplane was held to be of equal aerodynamic promise.

In full scale tunnel tests, the autogiro has a maximum L/D of about 7 with characteristics at a blade pitch angle of 4.6°. The Gyroplane on the other hand developed its highest L/D at zero pitch. These apparent contradictions are the subject of extensive analytical investigations.

At last year's conference, the Committee announced that the Platt Cyclogiro was to be built and tested in the propeller research tunnel. This project has been carried through on a Cyclogiro of 8 foot diameter and 8 foot span. In the Cyclogiro the blade elements rotate about a transverse axis, and a suitable cam system actuates appropriate feathering of the blades. Wind tunnel tests have definitely shown that by suitable actuation of the two cams, lift and thrust in any desired ratio can be produced, or in other words that the resultant force can be made to act in any desired direction. Another important result of the investigation was the demonstration of satisfactory autorotative properties in a powerless glide. The horsepower required to produce a thrust of 1,000 pounds was found to depend on the tip speed. Thus the horsepower was considerably less at a tip speed of 75 feet per second, than at 95 feet per second, while a tip speed of 150 feet per second required a greater amount of horsepower. This is in agreement with the results generally accepted for the lifting airscrew rotating in a horizontal plane. With a maximum blade angle displacement of between 20° and 30° and a tip speed of 75 feet per second, the gratifying figure of 20 pounds per horsepower was obtained. However, it is understood that the efficiencies obtained in forward flight (simulated by the tunnel airstream) were less satisfactory than anticipated from theoretical considerations.

Flutter Comprehensively Studied

In the discussion of flutter, a wing provided with a hinged rear flap, and having three degrees of freedom (via spring suspension and hinges for main wing and rear flap) was mounted in the blast of a small open throat tunnel. As the tunnel speed was increased the system gradually developed uncontrollable flutter which persisted at the highest speeds attained and disappeared as the speed decreased. The subject of the mathematical theory of flutter is not suitable for these brief notes, but a complete theory of flutter is being developed with every possible factor being considered. In all some twelve parameters are involved, and the effect of their variation is being studied.

Drag Reduction and Propulsion Efficiency

Some outstanding results of the accumulated data of the above topics are as follows: A tractor propeller with an air-cooled engine mounted at the leading edge of the wing reaches a propulsive efficiency factor of 75 whereas a pusher of the same type lags at 65. Therefore, a more intensive study of pusher air-cooled cowlings is in progress. Tandem propellers mounted under the wings develop a propulsive efficiency factor of only 63, and further research is being undertaken in reference to two tandem in-line engines with pusher and tractor propellers.

Useful data has been collected on the resistance of landing gears with partial retraction into wing and nacelles, and a remarkable example of fairing for the non-retracting landing gear was announced. From a drag of 98 pounds at 100 miles, an ordinary conventional landing gear with crossed members and unfaired wheels was reduced to two vertical cantilever members with faired wheels and a drag of only 13 pounds.

Fuel Injection and Airflow

The term airflow involves the use of an auxiliary spherical chamber above the combustion chamber of a solid injection fuel engine. The fuel is injected into the auxiliary chamber; on top of the piston in the main combustion chamber is a boss which fits with small clearance into the passageway between main and auxiliary chambers. In such an arrangement the compressed air passes from main to auxiliary chamber with great velocity. This high-velocity tangential airflow is effective in mixing fuel and air, and the result has been a considerable improvement in the mean effective pressure.

A difficulty in the solid injection engine has been the problem of starting. It has been found that the injection of a very small quantity of gasoline, initially, results in starting (continued combustion), at much lower r.p.m. than heretofore. To obtain good combustion in a solid fuel injection engine, the start of the injection should occur some 40 degrees before top center.

Last year it was reported that the safety fuel gave equal power to ordinary gasoline but involved a higher fuel consumption. Today by using the anti-detonation characteristics of this fuel and raising the compression ratio to 9½ to 1, the fuel consumption has been considerably lowered.

Stressed Skin

Distribution of loads between spars is affected by twisting action, and as a result of theoretical and experimental work, a definite interaction coefficient has been established. The interaction coefficient for a two-spar wing is very low for a single drag truss, somewhat higher for a double drag truss, and very high for stressed skin construction. The use of such an interaction coefficient (whose values will be published in a forthcoming NACA report) will be important in calculating spar bending moments.

Another interesting item was the classification of metal construction wing elements into skin, stiffeners, connections, etc. Visual demonstrations of sudden irregular failures of thin tubes in compression, and the more regular failure of thin tubes in torsion attracted attention from structural designers.

Loads and Pressures in Flight

The Committee is continuing its extensive and comprehensive investigations of loads developed in maneuvers, in landing, on wings and on tail surfaces. Seventeen types of airplanes have now been tested with the aid of orifices and multiple tube manometers, and the NACA recording strain gages. For airplanes cruising at 150 miles, the maximum accelerations developed in normal cross-country flying range between + 3½g and — 1½g. An additional instrument has been developed in the form of a water pressure recorder, which has been used to investigate the landing pressure distribution on the hull of a flying boat. The water acts against a number of small diaphragms whose minute deflections actuate a stylus, which in turn inscribes a line on a smoked glass plate or disc.

Another outcome of the pressure distribution experiments in full flight has been the close coordination between theory and test in the matter of span load distribution. The only departure from theory is where a wing is influenced by a cut out or by the presence of the fuselage. Thus on the lower wing of a biplane the fuselage reduces the air speed so much that the suction of the upper surface of the lower wing is greatly decreased near the fuselage. The load distribution is completely changed, with greater proportion of the load carried towards the tip. Such change in span load distribution has an important bearing on the initial assumptions in stress analysis.

Engine Cooling

In the study of engine cooling systematic variation in the front opening of the venturi was investigated. As this opening is increased so the ratio (volume of air admitted) / drag is improved, until the width of the front opening is .8 of the distance from the inner diameter of the cowling to its outer or maximum diameter.

An even more interesting line of research is the use of a blower for air cooling. An electrically driven blower is used to force air into an entirely-enclosed cylinder with an orifice box used to measure the volume of air delivered. By use of the blower the m.e.p. may be greatly increased without overheating and the blower uses a comparatively small proportion (about 4%) of the power of the single cylinder on which tests have been made.

Experiments in various forms of cylinder baffles and deflectors, experiments relating the fuel consumption to cylinder temperatures at various parts of the cylinder and other matters of vital importance to engine men were also reported during the meeting.

Letter from a Philosopher To General MacArthur

CY CALDWELL

GENERAL DOUGLAS MACARTHUR
Chief of Staff
United States Army.

Dear General MacArthur:

It was Sir William Osler, you may recall, who remarked that all men past forty should be chloroformed, or otherwise removed in some humane and painless manner. After reading his monograph, "Cerebral Palsies in Children and Old Military Men," I agree with him. Sir Bill holds that the mind tends to petrify after forty, a condition particularly applicable to Generals and editors, who often go through the motions of thinking, with no noticeable results.

The tragic effect, Sir Willie points out, is that the public is deceived, especially by the Generals, whose uniforms and medals give them an unduly impressive appearance. With an editor it doesn't much matter; for nobody pays any attention to him anyhow. But a General, charged with the defense of his country, commands respect for his ideas, whether or not those ideas merit respect.

Of course, I exclude you and me from this general oslerian condemnation for we still are a couple of pretty sprightly old boys—a trifle short in the wind, perhaps, but good for a few more years. I'm not doing any bragging about us, mind you, for I know that we are failing, here and there. But I don't advocate chloroforming either of us just yet. In 1940 I'll look us over again and write you what I think. That is, if I'm still able to think in 1940.

I'll tell you what brought this subject to mind. Recently I visited Casey Jones' School of Aeronautics at Rockefeller Center and I was grieved to learn how far behind the flying procession I had fallen. I started flying in 1915, kept it up steadily for fifteen years, and could start off for any place and guarantee to get there, unless the weather was too bad. That constituted a good pilot a few years ago. But not to-day. In really bad weather I'd now be helpless, for I haven't kept up with the procession. If Jim Farley ordered me to fly the mail through a storm I'd make arrangements in advance with the local undertaker. And General, if you decide that the Army should fly the mail again, you'd better try and get wholesale interment rates, to save the taxpayers money.

But getting back to Casey Jones and his school of advanced instrument flying, in which I have just taken a brief demonstration course—I haven't been modernized, mind you, but I've taken enough to learn that you and I have dropped behind. So far as modern flying and modern warfare goes, we are back where Orville Wright stopped flying, and where the Boers made peace with England.

Just to sketch in the aeronautical change, let me tell you briefly what happened to me at Casey Jones' School, in the Link Trainer, a device on which you learn to do instrument flying in a room. The Trainer is a small replica of an airplane, actuated by compressed air and a series of bellows; Casey gave me detailed instructions about how to fly by radio and instruments, and in I got. After a little practice I could handle the controls well enough, so they put the hood down and I took off on a "blind flight." They put me on the Detroit radio beam. Off I started and all by instrument tried to stay on that beam and keep the plane level and straight. I started west on the radio beam, and by mistake tuned in on Rudy Vallee's Fleishmann Yeast program. Then I turned to the yeast. (Don't shoot, pappy, I hain't a revenooer!) The air was a little rough over New York and the first thing I knew I got myself into a spin. Theoretically I crashed right onto Gimbel's roof, bounced off that, and hit Macy's where I got a discount of 6 per cent for cash. But a crash is nothing to an old pilot, so I got going again, crossed the Allegheníes, and crashed near Bellefonte. And I mean to say, if I'd been flying a real airplane that's what I would have done.

Now, General, if an old pilot like myself can drop behind the flying procession, a middle-aged General like you can drop behind the world's military procession. And that is what you and your fellow generals in the United States Army have done. It is my friendly regard for you and the Army that prompts me to point this retrogression out to you, for I don't want you to be caught in the lurch in the next war. I don't want you old boys to be using the tactics of Theodore Roosevelt at San Juan Hill when the world has moved on away from there; for if you do you're going to lose us a lot of men and put yourselves in the way of considerable abuse. And please don't get on your high horse and tell yourself that a civilian can't teach you anything; for when a war starts you Generals invariably demonstrate that you

(*Continued on page* 50)

"If I'd been flying a real airplane I'd have got myself in a spin"

AIR

Hot and Otherwise

●

FRANK A. TICHENOR

● The Independent Aviation Operators Association can do civil aviation a great deal of good—if they watch their step. They can do it a great deal of harm—if they try to promote only their own particular interests irrespective of the interests of aviation as a whole.

When the association was first organized in February, it looked mightily as though they were going to do the latter. Almost overnight, they sprang to arms, hastily designated the objectives they wanted to capture, and marched boldly into the policital woods of Washington without much, if any, preliminary reconnoitering. These tactics were too ingenious, however. The Independent Operators found themselves trying to carry so many such diverse objectives in one big offensive that they stood fair to carry none at all. The result was that they decided to halt their advance until they could strengthen their forces and plan their strategy more carefully. As this is written, they appear to be doing just that. And doing it more intelligently and carefully.

Knowing the men who have associated themselves prominently with the Independent Operators' movement, AERO DIGEST has until now avoided discussing the proposals of the group because we had confidence that those men would, in the calm following the first confusion of getting organized, work out their plans more constructively and with a greater degree of coordination. That confidence is being justified in many of the measures they are devising at present. In some of the others, though, we would still raise a hand of warning—"Drive Carefully!"

Two Constructive Measures

It has seemed to us right from the beginning that the Independent Operators could do themselves the most good by doing the most good for private flying, for the whole system of fixed base operations cannot survive and prosper unless non-commercial flying is stimulated to grow and prosper. In the past there has been too much of this thing of one commercial operator trying to live off the proceeds of doing business with other commercial operators. That was just taking money out of the left pocket and putting it in the right. Obviously, it was economically sound. From present signs, the leaders of the Independent Operators' association now recognize it was unsound. For they are now working on several measures which, if successfully carried out, would definitely encourage an increase in private flying. Their efforts to lower insurance rates on aircraft and the installment purchase plan they have been sponsoring are both commendable in this respect.

The former seeks to lower the rates on aircraft insurance by as much as 50 per cent. This is fine. But there is one aspect of the plan which bears careful thought One of the methods by which the I. A. O. hopes to get lower insurance rates is to establish a chain of regular stations throughout the country at which holders of this insurance will be allowed special rates on repair jobs. Whether or not the idea is that only members of the Independent Operators' association will be entitled to this insurance and these special charges, we haven't been informed. We hope that it isn't, however, because such a plan would not only be discriminatory, but would deprive the great body of private fliers of any of the benefits of this insurance. For, unless we miss our guess, most private fliers are going to be reluctant to become members of the Independent Operators' association. Not because they disapprove of the association or its policies. But because non-commercial pilots will not consent to losing their identity by being submerged in a commercial operators' organization. Nor will they be willing to endorse all the policies of such an organization as membership therein would, *ipso facto*, imply that they were doing.

Moreover, if the benefits of this insurance are to be limited to members only, the whole program is likely to get into difficulties. For in many states the insurance commission would either call a halt on the whole proceedings or demand that the benefits be extended to everyone without discrimination. Insurance plans seeking to offer special coverage and special rates to a chosen few have been put forward before, and every time they have encountered this snag.

Nevertheless, despite these drawbacks, the Independent Operators are to be applauded for their efforts in this direction. Exorbitant insurance charges have been one of the greatest handicaps to any marked increase in the ownership of airplanes. So it's a feather in the cap of the I. A. O. that it hasn't just sat back and bemoaned the situation; it has gone out with determination to do something about it. If the exact plan it is fathering isn't put across 100 per cent, if something a little less desirable is achieved, if the insurance commissions extend the benefits to everyone irrespective of their association affiliation, still the I. A. O. will deserve the credit for instigating a movement to get lower insurance rates for those who fly.

The association merits the same kind of plaudits for its efforts to get a reasonable installment purchase plan for aircraft. The marketing of airplanes has always been confronted with the obstacle that it lacked an effective time-payment arrangement. Such plans as have been offered in the past either have not been feasible or have not held much appeal to prospective buyers. In many respects, the I. A. O.'s present plan resembles that which General Motors uses in selling cars, and we need not remind you that that plan has been eminently successful. If there is a flaw in the set-up, it is possibly that the arrangement depends upon the good graces of the Reconstruction Finance Corporation, and that the activities of the R. F. C. depend upon the duration of the depression. It might be better if the plan could be financed through private sources.

Be that as it may, however, the one thing which cannot be questioned is that an installment purchase plan—and an attractive one such as this—is badly needed to facilitate the marketing of airplanes. Certainly, unless something drastic is done to increase purchases of aircraft for private use, the whole industry can never grow to the proportions it should.

Aids to Private Flying

In fact, we are convinced that the Independent Operators can do much more for themselves in the long run by following this line of endeavor than by attempting to push through Congress such measures as their proposal that the Government subsidize training by paying 25 per cent of the tuition of student pilots. For after all, their chances of getting anything of that sort across are too small to justify effort. Such proposals are immediately suspect; they smack too much of special privilege. Not so, however, with these constructive aims to lower insurance and make aircraft purchases easier. They are calculated to increase the tribe of private fliers. And to increase the number of such fliers tends to bring greater revenue to that section of aviation which provides the services private fliers must utilize in order to fly at all.

• EDITORIALS •

"My objects [in sponsoring the MacRobertson International Air Race from London to Australia] are: To deliver Australia from its isolation, which can only be effected by airplanes; to prove that a fast communication between Australia and England is possible; and to get people to dig up their atlases in order to find out where Melbourne is situated on our planet."—SIR MAC PHERSON ROBERTSON.

Return of the Air Mail Contracts

● The country's only first class mail—air mail—is being flown again by private operators to whom it is rightfully entrusted. Even though permanent legislation still is to come, it is quite evident that the government is elated over the fact that they are no longer being harangued by an indignant public and a vociferous press over a situation which so thoroughly got out of hand.

Postmaster General Farley assures us that everything is now going to be all right—the public is to benefit by an extended air mail system and the contractors will be highly pleased by the terms of the new air mail setup. He blythly neglects to mention that until such time as the Post Office sees fit to extend the daily schedules, air transport mileage will suffer a decrease of more than 18,000 miles in the amount flown per day. He skips happily over the fact that because of the Post Office's curtailed schedules, air transportation may suffer a sizeable decrease in patronage, unless the airlines, on their own initiative, maintain more flights than the government is paying for.

The legislative angle is a potential source of much grief and inefficiency if not settled definitely at this time. The House has disapproved the Senate's McKellar-Black bill and substituted one of its own. Essentially different from the the rejected bill (which would have left air transportation open to attack and subject to change at the whim of any publicity-seeking politician) the House bill shows greater familiarity with the true situation than was evidenced by Messrs. McKellar and Black. The proposed nonpartisan committee to study the situation and report back at the end of a year during which the private operators will be flying the mail, is a concession to the President's wishes. The proposed provisions for reducing the air mail rate to 5c an ounce, and flat payments of 35c per airplane mile for 100 pounds of mail and 3½ mills per mile for each additional 100 pounds or fraction thereof, will work to the advantage of the private carriers. It is axiomatic that poundage will increase as the postage rate is reduced; and as poundage increases so will the revenue to the contractor. One of the most significant clauses in the House bill is the stipulation that contractors whose contracts were cancelled may bid again, thus indicating that House members are not entirely in sympathy with the action taken by the Postmaster General in summarily condemning the operators without fair trial.

Although the cancellation was stupid and unjust, the operators will recuperate and continue their splendid technical progress, (taking their losses and hoping for an intelligent political regime). Nevertheless, if we had the constructive guidance of an understanding Post Office Department, even greater progress might have been achieved by this time and thousands of small investors would not have sustained the losses due to "reorganization." The "lower costs" pointed to with pride could have been arrived at with no interruption in the service and without having called upon the Army to make unnecessary human sacrifies on the altar of politics.

This Year's Business Outlook

● A three-year program recently announced by the War Department, calling for the expenditure of $50,000,000 for 1,000 planes, comes as welcome news to an industry which has received little from the government in the past year. The prospects for business took on a brighter aspect when the $7,500,000 PWA funds were finally released and turned over for Army aircraft purchases of 80 bombers and 30 attack planes. Before July 1, invitations to manufacturers for bids for from 300 to 400 planes of all types, should help put a little new life in the aircraft business.

The return of the mail business to the private operators will provide another stimulus for the manufacturing industry. Many companies are adding new equipment to augment their present facilities and to meet competition offered by the present trend of high-speed aircraft for express, mail and passengers.

Manufacturers of private aircraft are working on full schedules and the report is that it is more difficult to get delivery on ships than to get orders for them. Many engine manufacturers are taxing their facilities to the limit, with no immediate prospect of catching up on their orders.

These are the encouraging signs we have been seeking and perhaps by the end of the year we will be inclined to believe there really is a Santa Claus!

Governmental Aid For the Autogiro

● Autogiros offer possibilities of great importance, not only for military and national defense purposes, but also in the broader development of the field of commercial and private flying.

Abroad, steady progress in autogiro use is being made. Ships of this type have been ordered by the British Army for field operations use with its troops and by the Air Ministry for civil uses, including a large experimental cabin type. The Japanese Army is using them for observation purposes; the Russian government has built several for military use and the French Army and Navy are experimenting with the giro for military purposes. The Spanish Army, Navy and Police Force have each placed orders for new wingless autogiros, and the Italian, German and other governments are expressing keen interest in acquiring autogiros. In the light of these developments we shall soon be far behind these nations.

Autogiro development in this country has been seriously retarded because it has been forced to rely almost entirely on the private means of its sponsors and here in the United States, our autogiro factories are closed—without personnel, except for a few engineers carrying on research work.

There is much constructive development to be done which, if the present neglect of autogiro development continues, obviously will take several years to do, for the airplanes we have today are to a great extent the result of governmental assistance and recognition.

Criticism has been directed to the fact that while personal injuries have been negligible, the control of low-speed landings has been difficult with the result that some ships have been damaged. This criticism has had attention with the result the new-type giro developed and now flying successfully for several months abroad would indicate that the chance of ship damage is in the same category with the personal injury record. Very material increases in speed have also been obtained with further progress along these lines readily possible with development.

The autogiro can be of use to the Army in field operations, observation, photography, staff reconnaissance and ambulance service. The Navy might find it useful in observing gun-fire, liaison between ships and operating in restricted harbors,

(*Continued on page* 43)

Grand Central Air Terminal on which the Curtiss-Wright Technical Institute is located

The Curtiss-Wright Technical Institute

●

MAJOR C. C. MOSELY
President

● In Southern California, at least five manufacturers of transport, military and private airplanes are under capacity production. More than 3500 aeronautical engineers and skilled workmen are employed in these factories alone, and several hundred more are engaged in airline and general airplane maintenance and repair stations and in the smaller airplane factories in the district.

To meet the growing demand for trained engineers and mechanics, the Curtiss-Wright Technical Institute of Aeronautics is devoting its facilities to the practical education of master mechanics and engineering students so that upon graduation they can hold remunerative aviation occupations. Students are prepared so that without going through a long period of apprenticeship they can design, build and repair airplanes.

Curtiss-Wright "Tech" is located on the Grand Central Air Terminal, Glendale, Calif., one of the busiest air transport bases in the west. Besides being the western terminal for Transcontinental & Western Air and American Airways, Grand Central is the operations base for Pacific Seaboard Airlines, Airplane Development Corp. (subsidiary of the Cord Corp.), Kinner Airplane & Motor Corporation's flying activities, and other aeronautical enterprises including flying schools, sales and service stations and charter operations.

Here young men study aviation where aircraft are made and operated. Within a 25-mile radius of Grand Central, is found more aviation activity than in any other section of the country, and in transport airplane manufacturing, Southern California is producing more airliners than all other aviation centers combined.

While Airplane Development Corp. at Grand Central is producing a fleet of new all-metal Vultee transports, Lockheed Aircraft Corp., close by, is under capacity production building Vegas, Orions and the new bi-motor Electra.

A few miles away are the Douglas and Northrop factories, now under large-scale production of transport and military airplanes for airlines, the Army and Navy and foreign governments. Nearby also is the Kinner Airplane & Motor Corp. factory where engines and a line of monoplanes for sport and business use are built.

In the midst of this activity, where the personnel needs of manufacturers and operators are observed first hand, is Curtiss-Wright Technical Institute, housed in spacious quarters covering 14,000 square feet of floor space. The main school building is adjacent to the busy terminal building of Grand Central. The institute's quarters are divided into separate departments where the full attention of a student is concentrated on learning one subject at a time. The main section of the school building is divided into three departments; for metal fabrication and welding, for airplane construction and assembly, and for engine overhaul and repair. Equipped with the latest tools, these quarters have complete facilities for training students in production and repair methods as employed in the construction and service of modern airplanes and engines.

Adjoining the metal fabrication department is a ventilated, fireproof dope room, and separate quarters are provided for the machine shop and instrument testing department. Individual classrooms permit instruction without interruption of shop activities.

Laid out similar to a drafting room of an airplane factory, the engineering department is in a large room where each student has his own drawing table and individual file for his drawings.

Considerable care was exercised in selecting instructors who have a high

Metal Department, showing "Tech" students welding and fabricating fuselages

Master Mechanics class room and the Aeronautical Engineering and Drafting Department of the Curtiss-Wright Technical Institute

academic standing and extensive practical experience in their specialized fields.

The director of training is John George Miller, an educator whose background includes a master's degree in mechanical engineering; director of mechanical arts, State Teachers College and Long Beach Polytechnic High School; staff instructor, Emergency Fleet; supervisor, vocational teacher training, University of California at Los Angeles, and principal, Frank Wiggins Trade School, Los Angeles.

The dean of engineering is Stanley H. Evans, who was a flying officer in the Royal Air Force during the World War; graduate of the School of Military Aeronautics, Oxford University; graduate in aeronautical engineering, London University; chief technical assistant to Handley Page; aeronautical engineer, The Douglas Company and airplane designer of international recognition.

Dean Evans's assistant, Howard Poyas, instructor in drafting and elementary design, has had years of experience as mechanic, test pilot and airplane designer.

Chief instructor of the mechanic school is Lewis Holmes, a licensed pilot and mechanic, who in addition to supervising mechanical instruction, instructs classes in airplane construction.

The experience of Francis M. Cole, instructor in the engine department, includes: U. S. Air Service Mechanics' School, Kelly Field; enlisted instructor of airplanes; airplane and engine instructor, civil service rating, U. S. Air Corps Technical School, Chanute Field; chief instructor, Peruvian Air Service mechanics school; maintenance engineer, Peruvian Airways, division of Pan American Grace Airways, and two years with Curtiss-Wright.

Lawrence W. Muehleisen, formerly teacher at Pacific Technical University and for several years a metal fabrication specialist with a leading aircraft manufacturer, is instructor of the metal fabrication department.

The standard of training maintained by the institute has won it recognition by the California State Department of Education, which has approved the curricula for junior college standing in aeronautics and master mechanics. Under this recognition, Curtiss-Wright students receive credit toward a junior college diploma and title of associate of arts. The school is also approved by the U. S. Bureau of Immigration for instruction of non-quota students.

The facilities and academic standards of the institute have also won for it approval to give instruction in aeronautic courses for teachers, and such work is accepted by the State Department of Education toward certification in accordance with State standards. Each summer, vocational teachers come to the Curtiss-Wright Institute to receive instruction in aeronautics. The teacher training is conducted by Willard I. Staples, transport pilot, licensed mechanic and machine and auto shop instructor in charge of vocational teachers' examination in aeronautics for the California State Board of Education.

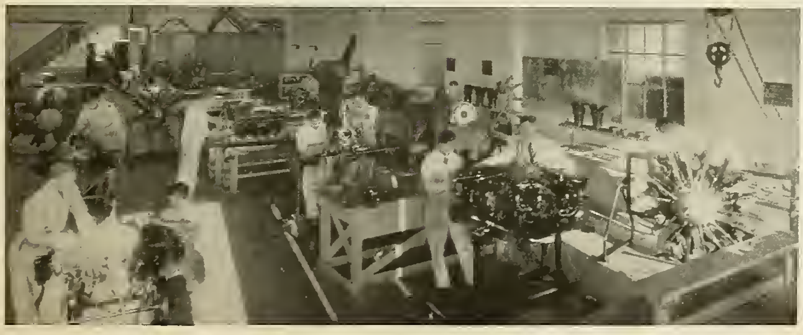
As a student enrolls in the master mechanic or engineering course, he starts his training immediately. His instruction is personal and individual, and records of his progress are kept on forms designed to meet the State Board of Education's requirements.

The master mechanic course consists of 1600 hours of instruction, which normally requires 40 weeks to complete. Of these, approximately 11 weeks are devoted to airplane mechanics, 10 to metal fabrication, 9 to engine mechanics, 3 to related technical subjects, 2 to line maintenance, and 1 each to traffic and weather, avigation, meteorology, aircraft instruments and air regulations.

The engineering course involves 2000 hours of instruction over a period of 50 weeks. In this course, special emphasis is laid upon accurate and clean drafting. Classes are held in engineering mathematics, airplane drafting, applied aerodynamics, manufacturing economics, airplane structures, airplane design and practical shop work.

The student who takes this course learns to apply systematic engineering methods to the design and construction of a typical modern airplane. He follows in each problem the same procedure, consisting of analysis, application of theory, modification of results in accordance with successful practice, and production

(*Continued on page* 45)



Students in the Engine Department working on various types of aircraft engines

Douglas and Northrop

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THEIR HISTORICAL DEVELOPMENT, SCOPE OF ACTIVITIES AND EXECUTIVE PERSONNEL

The sixth of a series of feature articles relating to the major aeronautical organizations of the United States

● Donald Wills Douglas started an airplane business fourteen years ago when he was but 28 years of age. A Naval Academy man, class of 1913, in his senior year he matriculated at Massachusetts Institute of Technology, where specializing in engineering, he was able to give more time and attention to his increasing interest in the science of aeronautics.

After completing his course at M.I.T., he joined the Glenn L. Martin Company in Los Angeles as chief engineer. In 1916 he went to Washington to fill a similar position with the Aviation Section of the Signal Corps and the following year, when Martin organized a new aviation company in Cleveland, Douglas was given the position of chief engineer. After three years, he resigned to embark in an aircraft venture of his own.

Eventually Douglas got his enterprise under way and began manufacturing aircraft in an abandoned tool shed of the Goodyear Rubber Company in Los Angeles. Such work as could not be fabricated with the facilities afforded the half-dozen employees, was sub-let to local manufacturers. In this way, the first airplane, the Cloudster, was built, successfully flown and prepared for a non-stop transcontinental flight. On its first trial, however, engine trouble forced it down near El Paso, Texas.

About this time (1921), the Navy Department announced a competition for a torpedo plane, and the company decided to concentrate its engineering facilities in that direction. Douglas entered into a contract with the Navy to design and build three experimental planes, and with less than a dozen employees, limited facilities, and other difficulties, completed the contract on schedule. This alone was a triumph, but the climax of that achievement was the award of first place in the competition, carrying with it a contract for eighteen more planes. This promising turn of affairs necessitated search for larger quarters and more extensive facilities for manufacture and assembly.

Donald W. Douglas

In Santa Monica he located an abandoned motion picture studio, which suited his purposes and new equipment was gradually installed.

The torpedo plane, known as the TD-2, proved outstanding. It was a twin-float, Liberty-powered biplane which, with full load, climbed 3,000 feet in 10 minutes and attained a speed of 100 miles an hour. Powered by a Wright D-2, the plane climbed 4,000 feet in 10 minutes and attained a speed of 110 miles an hour.

It was about this time that Harry H. Wetzel joined Douglas as general manager, an association that has continued to the present time.

By outstanding designs, careful workmanship and astute management, the company expanded and prospered. For seven years Douglas put back into the business every dollar he earned, for the purpose of obtaining better equipment so that greater obligations could be assumed.

During this time his planes were establishing names for themselves by impressive showings in duration, distance and altitude with varying weights of

Harry H. Wetzel

J. H. Kindelberger

Carl A. Cover

T. C. McMahon

H. P. Grube

LEFT: Aerial view of the spacious Douglas factory on Clover Field, Santa Monica, Calif., in which more than 2,500 employees are now engaged in producing military and commercial aircraft.

BELOW: Types of Douglas aircraft produced for the United States military air forces.

useful loads. The Navy torpedo planes attracted such favorable attention as load carriers that the Army commissioned the company to construct the airplanes it was to use in the first attempt to circumnavigate the earth by air. This was the opportunity which was to focus the attention of the world upon Douglas airplane accomplishments.

In 1924, on April 6, four specially Douglas-designed Army planes took-off from Seattle on the first leg of the flight around the world. The flight was completed 175 days later, two of the planes making the entire trip of 27,553 miles.

That two of the four World Cruisers that took off actually returned practically intact, with most of their original finish, and still airworthy, was an achievement that was heralded in all parts of the world.

Early Developments

These planes were obliged to withstand acute changes in temperature, were buffeted by seas which made it impossible for light surface craft to reach them at their moorings, underwent the stress and strain of high altitudes and jungle humidity and were under cover only twelve days during the entire period. The World Cruisers, designed as land or water, long-distance craft, readily convertible to either type by an interchangeable gear, were first to bring the Douglas name prominently before the general public and led to its first foreign contract, with the Kingdom of Norway.

In 1924 Douglas developed an experimental observation type, the XO-2 and the C-1 Transport, both for the Army Air Corps, and in the following year entered (and won) the Army's competition for observation-type aircraft. These observation planes, which are also used as light bombers, have found markets in Mexico, Peru and China.

When the government started the transportation of mail by air, under the Post Office Department, Douglas airplanes were selected for this historic experiment, and when Western Air Express decided to carry the mail, Douglas planes, specially adapted for this purpose, were purchased. Some of these planes have traveled a distance equivalent to 25 times around the world at the equator and have served through the useful life of 20 engines.

Expansion Necessary

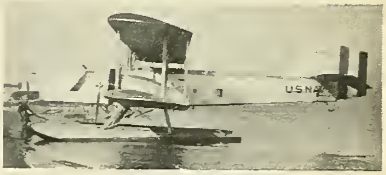
Other military developments followed, such as torpedo and patrol planes for the Navy and observation, training and bombing types for the Army. These planes command little notice outside of military circles, but the nature of their missions calls for unusual engineering skill in order to produce equipment acceptable to the military services and comparable or superior to that used by the other great world powers.

In the ensuing years Douglas continued to develop new aircraft, particularly military types. For the Navy, the T2D-1 was a three-purpose craft for torpedo carrying, bombing and scouting. Convertible for land or sea use, it featured deck-landing and catapulting equipment. The Army planes developed included the XA-2, a heavily armed attack plane, the O2-H, a refinement of the original observation type and the XO-4, an observation training biplane.

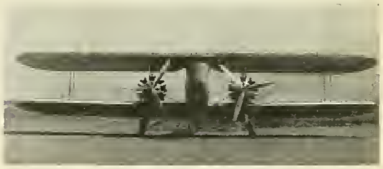
The commodious motion picture studio soon proved inadequate to meet the increasing demand for Douglas airplanes, and additional temporary buildings were erected on the leased site. By 1928 the company had increased its manufacturing floor area to 65,000 square feet and was employing about 500 people.

Douglas aircraft had carried the name of Santa Monica to all parts of the world, and in line with the ideas of other American cities, Santa Monica wished to further identify itself with aviation by establishing a municipal airport. At the

Torpedo plane for first service contest



The T2-D Seaplane



The T2-D as a landplane

World Cruiser as landplane

Douglas PD-1 patrol boat

Twin-engined Dolphin

Douglas observation ships on the line

The new high-speed TWA transport

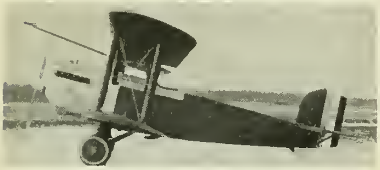
A new transport under construction

same time there was the possibility of the company, whose lease soon expired, taking permanent root in Santa Monica, if it could be prevailed upon to purchase a site.

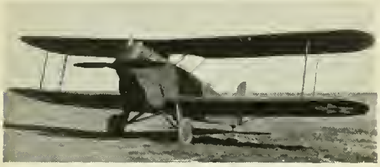
A plan was worked out whereby the Douglas company bought eight acres of ground on Clover Field on which a modern aircraft factory was erected. The city purchased the balance of the site, 160 acres, to be used as a municipal flying field, and permitted the company its use for experimental flying under a 10-year renewable contract, at a nominal rental.

When the lease on the motion picture site expired in July, 1929, the company was established on Clover Field in a modern, well-equipped plant, capable of handling available and potential business and with room for further expansion as it became necessary.

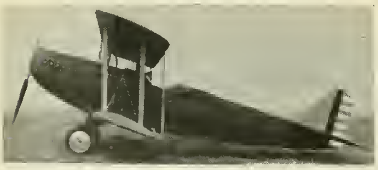
In its new plant Douglas continued to manufacture its several models for military and mail transportation purposes. A production line was maintained on adaptions of the O-2 series with O2-H and O2-K as the models manufactured during 1929. A contract for Navy patrol boats was also filled and the company carried on its payroll from 500 to 950 employees during the year. Shortly thereafter, Douglas departed from its long-established practice of manufacturing almost exclusively for military needs and introduced the Dolphin for the commercial market. The plane, a twin-engined amphibion, introduced some years before, had found particular favor with the Army, Navy and Coast Guard, but its rise as a private commercial plane was rapid and this year will see it used by such sportsmen as Alfred G. and William K. Vanderbilt, Jr., Powell Crosley, Jr., and P. K. Wrigley. It will also be flown in the South Atlantic region by the Argentine Navy.



Douglas XO-2



First of the Army's observation series



Douglas O2-H

The High-Speed Airliner

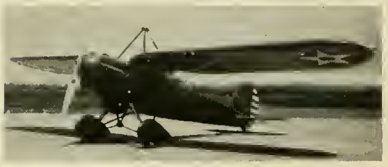
Late in 1932, Douglas designers were engaged on a new model airline transport to meet the specifications of Transcontinental & Western Air, Inc., and the most sensational development in years came out of the Douglas plant last year when the operator received the first model of its new equipment program. The performance of this airplane attracted attention from commercial operators in all parts of the world and shortly after trial performances were publicized, commissions from seven different European countries visited the factory. Anthony Fokker purchased a license to manufacture the transport in Europe and it is expected that it will soon be flying the airways of North and South America and Europe.

A description and performance figures of the new Douglas transport plane appeared in the October, 1933, issue of AERO DIGEST. Its trip from Los Angeles to New York in 12 hours 28 minutes (actual flying time) with the last load of mail when TWA transferred that task over to the Army Air Corps, and its single-engine flight from Winslow to Albuquerque, with a full load of 18,000 pounds are outstanding performances.

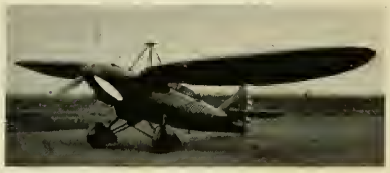
Record breaking has become habitual with the Douglas Airliner, one of which is now in service between Pittsburgh and New York and a fleet of which will be in service on the TWA system this summer.

The latest record established by the big all-metal monoplane and its two 710 horsepower Wright Cyclone engines is that of the longest non-stop flight ever made by a passenger transport. The flight was between Los Angeles and Wichita, 1296 miles, during which a speed of 199.2 m.p.h. was maintained.

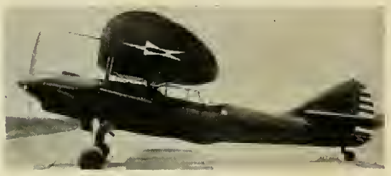
The flight was made by the second of the fleet of 41 airliners produced for TWA and illustrates its tremendous cruising range. The long cruising range was built into the plane, together with its



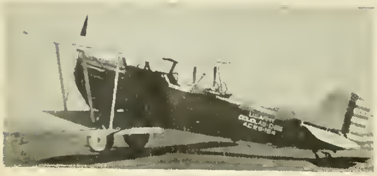
Gull-winged YO-31 with Conqueror



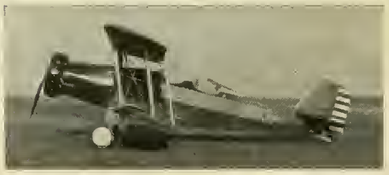
Conqueror-powered YO-31A



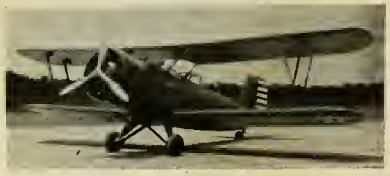
Latest type Douglas YIO-43



Douglas O-25 with Conqueror



Douglas O-38



Latest observation biplane, O-38E

First Douglas Army transport

Douglas World Cruiser "Chicago"

Mail plane used by Post Office in 1925

high-speed and unusual comfort, as an added safety factor which would enable the plane to fly over any area of unfavorable weather that might develop.

Other records held by the TWA Douglas include the 3 hour 10 minute Chicago to New York flight; the 1 hour 23 minute Pittsburgh to New York flight and the 6 hour 40 minute flight from Los Angeles to Kansas City.

At the end of its last fiscal year (Nov. 30, 1933) the Douglas organization had built 1,100 airplanes, its personnel had grown to 2,500, of whom 288 are employed in the engineering department, and its plant had increased from an abandoned tool shed to a modern, well-equipped factory with 350,000 square feet of manufacturing floor space.

Officers and executive personnel of the Douglas Aircraft Company are Donald W. Douglas, president; Harry H. Wetzel, senior vice-president and general manager; J. H. Kindelberger, vice-president in charge of engineering; Carl A. Cover, vice-president in charge of sales; T. C. McMahon, secretary; H. P. Grube, treasurer; Geo. A. Strompl, general superintendent; Robert Webster, chief process engineer; Erik Springer, chief production planning, and Edward R. Doak, purchasing agent.

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THE NORTHROP CORP.

Although the present Northrop Corporation is but two years old, having been founded as a subsidiary of the Douglas Aircraft Co., in January, 1932, its work is so closely associated with John K. Northrop, president, that its history logically could be dated from the time he first entered aviation in 1918.

Northrop received his initial aviation experience with Loughhead Bros., who, in Santa Barbara, Calif., were building flying boats for the Navy. Associated with the Douglas Aircraft Co., a few years later, Northrop took an active part in the design of some of the Douglas military aircraft and subsequently conceived and laid out the basic design of the all-wood Vega monoplane which, in its time, came to be recognized as the fastest commercial airplane in the world.

Northrop's Early Efforts

It was about that time that Northrop first became associated with W. K. Jay who, sensing the possibilities of the Vega design was instrumental in organizing, in cooperation with Allan H. Loughhead, the Lockheed Aircraft Co., in 1926. Northrop became chief engineer of the new company which a year later began production of the plane which featured a plywood-covered cantilever wing and a monocoque fuselage.

After the Lockheed Vega and Air Express had been put into production, Northrop and Jay left the Lockheed company and, in 1928, organized The Avion Corporation, which later became the Northrop Aircraft Corporation, a subsidiary of United Aircraft & Transport Corporation.

As engineering head of his own company, Northrop had an opportunity to work on some of his own plans. One of his basic ideas was that an airplane should be built of metal which would be adaptable to modern machine methods of quantity production. For this he developed a new type of metal fabrication which involved stamping out duralumin shapes. He tested out his ideas on airfoils and streamline bodies, and built an experimental "flying wing," from which many lessons were learned.

The culmination of the experimental work of 1928 was the all-metal, low-wing Northrop Alpha which made its appearance in 1929 as a six-passenger cabin plane with a top speed of 170 miles per hour. It embodied a new type of flat-plate multicellular wing structure, and a smooth-skin metal fuselage of streamline form.

After United Aircraft moved the Northrop factory from Southern California to Wichita, Northrop and Jay returned to the Pacific Coast, and in conjunction with the Douglas Aircraft Company organized The Northrop Corporation in January, 1932. The directors of the Northrop Company were Donald W. Douglas, Harry H. Wetzel and William Stewart, Jr., representing the Douglas Aircraft Company, and Northrop and Jay.

As a subsidiary of the Douglas company, the new Northrop Corporation established its factory adjacent to the Los Angeles municipal airport at Inglewood. Here the Gamma and later the Delta, advanced developments of the original Alpha and embodying every proved principle known to aeronautical science, were put into production.

The first plane produced in 1932 was the Gamma for the Lincoln Ellsworth Antarctic expedition. The second was Frank Hawks' Gamma, the Texaco *Sky Chief* which has since established many inter-city speed records. A description of the *Sky Chief* appeared in the January, 1933 issue of AERO DIGEST.

W. K. Jay

D. R. Berlin

John K. Northrop

J. C. Garrett

G. H. Irving

Two-place Cyclone-powered Northrop experimental attack plane

On June 2, 1933, Hawks made one of the outstanding flights of the year in his Gamma powered by a Wright Whirlwind double-row engine. Leaving Los Angeles in the early morning he started east and encountered fog in the San Bernardino Mountains. However, from there on across Colorado, north of Kansas City and Indianapolis and over Pittsburgh, thence into New York he had fair weather, landing in 13 hours 26 minutes, a new non-stop record which broke his former record of 17 hours 36 minutes made almost four years previously. His average speed was 181 miles an hour. Other fast flights made by Hawks in the *Sky Chief* include a Los Angeles-Atlanta trip, non-stop in 11 hours 45 minutes and a Regina-Bridgeport flight of 1700 miles in 7 hours 55 minutes.

The first Gamma produced was loaded aboard a steamer and shipped to the Antarctic with the Lincoln Ellsworth expedition. After coming safely through a very rough sea voyage, the ship made a successful flight of 40 minutes duration, but when the shelf ice on which it was moored broke, it fell between two pieces and drifted helplessly for many hours. When finally retrieved and found unfit for for further flying, it was returned to the Northrop factory where a complete overhauling and reconditioning prepared it for further work in the polar regions.

The high speed and load-carrying ability of Northrop single-engine airplanes, combined with their reliability and durability, have won for them a place in transport and military service throughout the world. Some of the most prominent operators of Northrop planes are T.W.A., Pan American Airways, the U. S. Army and Navy, and foreign governments and airlines. More than 100 Northrop airplanes have been placed in service.

The outstanding performance of Northrop airplanes is repeatedly attracting world-wide attention. For instance, last month airline speed records were broken by Northrops in both Europe and the United States.

Northrop Alpha

Ellsworth's Gamma

TWA's record-breaking Gamma

Frank Hawks' "Sky Chief"

Jack Frye, vice-president in charge of operations of T.W.A., set a new transcontinental mail record of 11 hours 31 minutes, flying a Wright Cyclone-powered Gamma transport which averaged 227 miles per hour from Los Angeles to Newark.

In Sweden a new record for scheduled transportation in Europe was set when a Northrop Delta P. & W.-powered monoplane flew non-stop from Stockholm to Paris (a distance of 1,000 miles) in 4 hours 40 minutes, at an average speed of 214 miles per hour. On its record flight over the line of A/B Aerotransport, the Delta carried passengers and a heavy cargo of mail in addition to the pilot and radio operator.

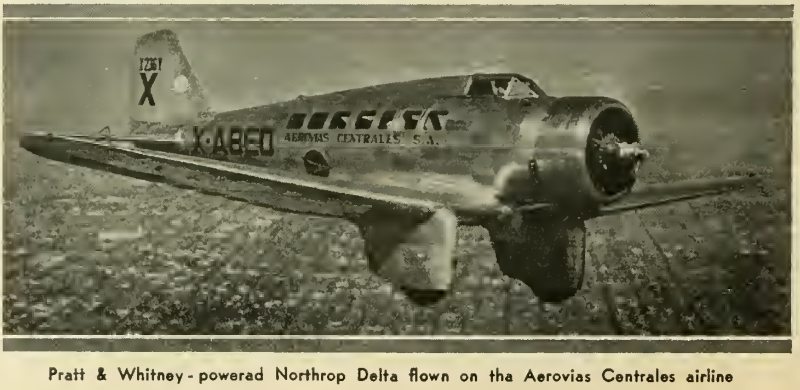
Sales to Foreign Markets

Export sales account for more than half of the current production at the Inglewood factory, and of 17 all-metal monoplanes scheduled for delivery during April and May, 10 were produced for the export market.

The demand for Northrop aircraft has grown so rapidly that manufacturing floor area at the Inglewood factory recently was doubled, and a third plant unit is now under construction.

Last year the corporation brought out the following new models for the transport market: the Delta 1-A, a 9-place, all-metal, low-wing, cabin monoplane powered by a Wright Cyclone engine and the Delta 1-B, a slight revision of the former, equipped with a Pratt & Whitney Hornet engine. For the Army, Northrop produced the model 2-C a 2-place, all-metal, low-wing monoplane, and for the Navy, the Northrop XFT-1 shipboard fighter was produced experimentally.

The payroll of this factory now totals 1,000 men who are under the direction of John K. Northrop, president; W. K. Jay, vice-president and general manager; Don R. Berlin, chief engineer; J. C. Garrett, purchasing agent; Gage H. Irving, pilot salesman; Arthur Mankey, chief draftsman; R. L. Stiles, auditor and Harry O. Williams, superintendent.



Pratt & Whitney - powerad Northrop Delta flown on tha Aerovias Centrales airline

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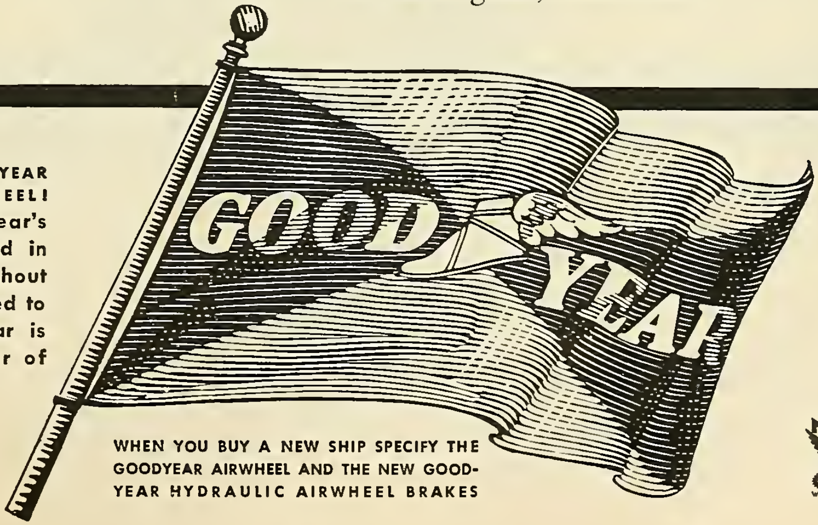

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AVIATION ENGINEERING

TECHNICAL EDITORS: GLENN D. ANGLE • PROF. ALEXANDER KLEMIN • DR. MAX MUNK • DR. MICHAEL WATTER

Filtration of Sound in the Airplane

PART ONE: ELECTRICAL AND MECHANICAL ANALOGIES

●

ALEXANDER KLEMIN

Daniel Guggenheim School of Aeronautics, New York University

● Sound filters have an obvious and important application in the inlet and outlet of the ventilation system. While aeronautical engineers use with familiarity the principles and language of applied mechanics or electricity, it is not quite as certain that they are equally at home in applied acoustics. Therefore, it is proposed in this article to precede the discussion of sound filters with an exposition of the acoustical principles involved. The easiest approach is by way of the electrical circuit, and the equation for mechanical vibration. Only sound filters properly so-called will be considered, and *not* silencers.

An Electrical Circuit Containing Resistance, Inductance and Capacity

The fundamental and familiar equation for an electrical circuit containing resistance, inductance and capacity (as in figure 1) is

$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E_0\, e^{\,i\omega t} = E_0 (\cos \omega t + i \sin \omega t) \;.\;.\;.\;.\; (1)$$

Where

R = resistance
L = inductance of a coil
C = capacity of a condenser
E_0 = maximum value of the alternating applied voltage
q = charge of electricity in the condenser
t = time
$\omega = 2\,\pi n$ where n = frequency
$i = \sqrt{-1}$

Now $$\frac{d}{dt}\cdot e^{i\omega t} = i\omega e^{i\omega t}$$

$$\frac{d^2}{dt^2}\, e^{i\omega t} = -\,\omega^2\, e^{\omega t}$$

So that $$\frac{d}{dt} = i\omega$$

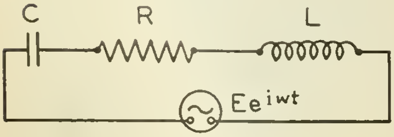

Figure 1

and $$\frac{d^2}{dt^2} = -\omega^2$$

Hence the equation may be written:

$$\left(-L\omega^2 + iR\omega + \frac{1}{C}\right) q = E_0 e^{i\omega t} \;.\;.\;.\;.\;.\; (2)$$

Differentiating both sides:

$$\left(-L\omega^2 + iR\omega + \frac{1}{C}\right)\frac{dq}{dt} = i\omega E_0 e^{i\omega t}$$

and $\frac{dq}{dt} = \dot{q} = I$ = current in the circuit at any instant.

So that $$I = \frac{i\omega E_0 e^{i\omega t}}{-L\omega^2 + iR\omega + \frac{1}{C}}$$

and by simplification and transposition

$$= \frac{E_0 e^{i\omega t}}{+\,R + i\left(L\omega - \frac{1}{\omega C}\right)} \;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\; (3)$$

The expression $R + i\left(L\omega - \frac{1}{\omega C}\right)$ is known as the impedance, and is a vector or complex quantity generally denoted by Z. It has an absolute value

$$\left(Z\right) = \sqrt{R^2 + \left(L\omega - \frac{1}{\omega C}\right)^2}$$

Substituting the term Z in equation (3) we have

$$\left.\begin{aligned} I &= \frac{E_0 e^{i\omega t}}{Z} = \frac{E}{Z} \\ \text{or } E &= I\,Z \end{aligned}\right\} \;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\; (4)$$

Considering equation (3) a little further and multiplying the right hand-side top and bottom by $R - i\left(L\omega - \frac{1}{\omega C}\right)$:

$$I = \frac{E_0\, e^{i\omega t}}{R + i\left(L\omega - \frac{1}{\omega C}\right)} \cdot \frac{R - i\left(L\omega - \frac{1}{\omega C}\right)}{R - i\left(L\omega - \frac{1}{\omega C}\right)} =$$

$$\frac{E_0 e^{i\omega t}\left[R - i\left(L\omega - \frac{\omega C}{1}\right)\right]}{R^2 + \left(L\omega - \frac{1}{\omega C}\right)^2}$$

Putting $\sin\theta =$

$$\frac{L\omega - \frac{1}{\omega C}}{\sqrt{R^2 + \left(L\omega - \frac{1}{\omega C}\right)}}$$

$$\cos\theta = \frac{R}{\sqrt{R^2 + \left(L\omega - \frac{1}{\omega C}\right)}},$$

$$\tan\theta = \frac{L\omega - \frac{1}{\omega C}}{R} = \frac{L\omega^2 - \frac{1}{C}}{R\omega}$$

and

$$I = \frac{E_0 e^{i\omega t}\,(\cos\theta - i\sin\theta)}{\sqrt{R^2 + \left(L\omega - \frac{1}{\omega C}\right)^2}} =$$

$$\frac{E_0 e^{i\omega t}\, e^{-i\theta}}{|\,Z\,|} = \frac{E_0 e^{i(\omega t - \theta)}}{|\,Z\,|} \;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\; (5)$$

Impedances in Parallel

If two impedances Z_1 and Z_2 are placed in parallel as shown in figure 2, and E is the alternating E. M. F. across the two branches, then we can say that the total current through the circuit is equal to the sum of the currents in the two branches. If Z is the resultant impedance of the circuit, we can write

$$\frac{E}{Z_r} = \frac{E}{Z_1} + \frac{E}{Z_2}$$

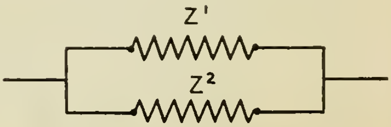

Figure 2

THE COLLIER TROPHY AWARD FOR 1934

"To the Hamilton Standard Propeller Company, with particular credit to Frank Walker Caldwell, Chief Engineer, for the development and demonstration of a Controllable Pitch Propeller now in general use."

HAMILTON STANDARD
CONTROLLABLE PITCH PROPELLERS

and $$\frac{1}{Z_r} = \frac{1}{Z_1} + \frac{1}{Z_2}$$

so that
$$Z_r = \frac{1}{\frac{1}{Z_1} + \frac{1}{Z_2}} = \frac{Z_1 \cdot Z_2}{Z_1 + Z_2} \quad \ldots\ldots (6)$$

where all three forms Z_r; Z_1 and Z_2 may be complex.

An Electrical Low Pass Filter

In figure 3 is shown an electrical circuit in which $A^1\ B^1\ C^1\ D^1$ is a line without impedance. There *are* impedances in series along the line A B C D, and impedances in the shunts between the two lines A B C D and $A^1\ B^1\ C^1\ D^1$. The currents along the line A B C D are indicated by I_A, I_B, I_C,....and those in the shunts by I_a, I_b, I_c,.....

The current through B B^1, $I_a = I_A - I_B$ and current through C C^1, $I_b = I_B - I_C$.

Now considering the ξ. M. F. acting around the mesh B C C^1 B^1, the voltage drop across B B^1 C^1 must equal the voltage drop across B C C^1, and since there is no impedance in B^1 C^1

$$Z_1\, I_B + Z_2\, I_b = Z_2\, I_a.$$

Substituting for I_a and I_b from the equations as above

$$Z_1\, I_B + Z_2\,(I_B - I_C) = Z_2\,(I_A - I_B).$$

Hence

$$I_B\,(Z_1 + 2Z_2) = Z_2\,(I_A + I_C)$$

and

$$\frac{I_B}{I_A} + \frac{I_B}{I_C} = 2 + \frac{Z_1}{Z_2} \ldots\ldots\ldots (7)$$

Extending the circuit indefinitely on either side, it is clear from considerations of symmetry that

$$\frac{I_B}{I} = \frac{I_C}{I_B} = \frac{I_D}{I_C} = e^{\lambda}$$

Where λ is the propagation constant, and e^{λ} is the ratio of the current in one section of the upper line A B C D to that in the preceeding section

Hence we can change equation (7) to read:

$$e^{\lambda} + e^{-\lambda} = 2 + \frac{Z_1}{Z_2} \ldots\ldots\ldots\ldots (8)$$

Since $$\frac{e^{\lambda} + e^{-\lambda}}{2} = \cosh \lambda$$

(from the theory of hyperbolic functions)

$$\cosh \lambda = 1 + \tfrac{1}{2}\,\frac{Z_1}{Z_2} \ldots\ldots\ldots\ldots (9)$$

Now if in the line A B C D we have pure inductances of strength L and in the shunts pure capacities C, then the impedance

$$Z_1 = i\omega L$$

and the impedance

$$Z_2 = \frac{i}{\omega C.}$$

and the ratio

$$\frac{Z_1}{Z_2} = \frac{i\omega L}{-i/\omega C} = -\,LC\omega^2 \ldots\ldots (10)$$

which is a real number.

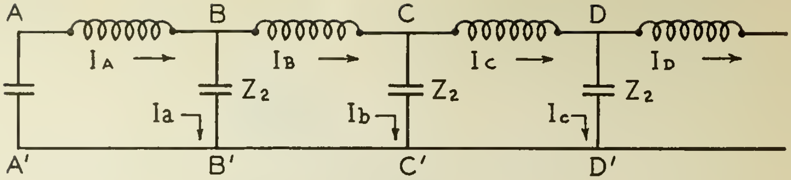

Figure 3

If Z_1/Z_2 is a real number, then it is clear from Equation (9) that cosh λ is a real number. But by the theory of hyperbolic functions cosh λ = cos iλ, and therefore if cosh λ is real, and cos iλ is real, λ itself must be imaginary.

Suppose that the imaginary $\lambda = i\mu$ where μ is a real number.

Since $\frac{I_B}{I_A} = e^{\lambda}$, $I_B = I_A\, e^{\lambda}$

and putting $\lambda = i\mu$

$$I_B = I_A\, e^{i\mu} = I_A\,(\cos\mu + i \sin\mu) \,..\, (11)$$

Now in an alternating current circuit, the current I_A is of the form

$$\frac{E_0\, e^{i(\omega t - \theta)}}{(Z)}$$

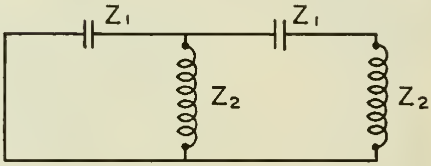

Figure 4

Where (Z) is a real number, then I_B is of the form

$$\frac{E_0\, e^{i(\omega t - \theta)}\, e^{i\mu}}{(Z)} = \frac{E_0\, e^{i(\omega t + \mu - \theta)}}{Z}$$

In other words the current I_B is no smaller than the current I_A, but has a different phase. It follows that as long as λ is imaginary, the current passes indefinitely through section after section *without* attenuation.

It remains to be seen for what limits of values of ω, there will be such propagation without attenuation.

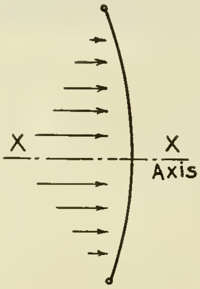

Figure 5

We have cosh λ = cos iλ = cos i (iμ) = cos μ = a real number. Therefore cosh λ can vary only between 1 and —1.

1. Putting $\cos\mu = 1 = \cosh\mu = 1 + \tfrac{1}{2}\,\frac{Z_1}{Z_2}$ (from Equation 9) we find that $\frac{Z_1}{Z_2} = 0$. But by Equation (10) $Z_1/Z_2 = LC\omega^2$. Therefore one limit for ω is $\omega_1 = 0$ and frequency $n = 2\pi\omega = 0$.

2. Putting $\cos\mu\ {-1} = 1 + \tfrac{1}{2}\,\frac{Z_1}{Z_2}$, we find that $\frac{Z_1}{Z_2} = -4$ and $-4 = -LC\omega^2$ so that $\omega_2 = \frac{2}{\sqrt{LC}}$ and $n_2 = \frac{1}{\pi\sqrt{LC}}$.

Between frequencies of $n_1 = 0$ and $n_2 = \frac{1}{\pi\sqrt{LC}}$, therefore, this low pass filter will transmit the current without attenuation.

High Pass Electric Filter

If, as in figure 4, the circuit is changed so that the line A B C D contains pure capacities, and the shunts pure inductances, then it will be found that only high frequency currents will pass without attenuation. Suitably modified circuits will allow only certain bands of frequency to pass through. Having established the electrical analogy for a low pass acoustic filter, we shall deal with the acoustic high pass filter in its own acoustical terms later.

Mechanical Analogy with the Electrical Circuit

As a transition from the electrical circuit to the sound circuit, we shall consider a mechanical analogy in the motion of a diaphragm clamped at its edges (see figure 5) under varying pressure.

Let m = mass of the diaphragm
S = area of diaphragm
x = displacement from its neutral position
K = coefficient of damping or dissipation of energy due to velocity of displacement of the diaphragm
f = stiffness coefficient
p = $p_0 e^{i\omega t}$ = alternating excess pressure exercised on the diaphragm acting on unit area of the diaphragm.

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Then the equation of motion becomes.

$$\frac{md^2x}{dt^2} + K\frac{dx}{dt} + fx = Sp_o e^{i\omega t}$$

Comparing this with the electrical equation

$$\frac{Ld^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E_o e^{i\omega t}$$

we see that:

1. Mass is analogous to electrical inductance.
2. Displacement is analogous to the electric charge present in the circuit.
3. Velocity or rate of displacement is analogous to rate of change of quantity of charge, or in other words to the current.
4. Stiffness is analogous to the inverse of the capacity.
5. The damping coefficient is analogous to the electrical resistance.

Since the electrical equation and the mechanical equation of motion are exactly similar in form, we may conclude that their solutions are also similar, and write down the following statements

1. $$\frac{dx}{dt} = \frac{Sp}{Z} \text{ or } x = \frac{Sp}{Z};$$

$$Z = \frac{Sp}{\dot{x}}; \text{ where } \dot{x} = \frac{dx}{dt}$$

Where Z is the mechanical impedance, $K + i\,(m\omega - f/\omega)$.

2. There is a mechanical resistance K analogous to R.

3. There is a mechanical reactance $(m\omega - f/\omega)$ analogous to the electrical reactance

$$\left(L\omega - \frac{1}{C\omega}\right)$$

4. The absolute value of the mechanical impedance

$$= \sqrt{K^2 + L\omega - f/\omega)^2}.$$

5. The phase angle θ of the rate of displacement is given by the equation

$$\tan\theta = \frac{m\omega^2 - f}{K\omega}$$

6. $$\frac{dx}{dt} = \frac{Sp_o\, e^{i(\omega t - \theta)}}{\sqrt{K^2 + (m\omega - f/\omega)^2}}.$$

While we began with an electric circuit as being so generally understood, it is most important to bear the mechanical analogies in mind when passing to consideration of acoustical devices.

The Acoustical Problem

Granted that electrical circuits can be devised that will transmit certain frequencies or selections of frequencies with or without attenuation, our problems are to determine what acoustical elements are analogous to the electrical elements, and to combine these elements in such fashion that they will filter out undesired noises in the ventilation system.

Part 2 of the present article will deal with such definition and use of acoustical elements, and the possibility of their ready application to aircraft uses.

Digest of Technical Articles from Foreign Publications

High Speed Propellers

The Characteristics of Airscrews Revolving at High Tip Speeds. N. Erojov. (Russia) Central Aero-Hydrodynamical Institute, Moscow. Report 158.

A SERIES of tests was conducted on nine propellers of low pitch diameter ratios in the C. A. H. I. wind tunnel, six of different airfoil section and three having various thickness ratios. Tests were made of tip speeds varying up to 20.85 times the velocity of sound in air. The results showed that for full-scale propellers, the critical speed is close to the velocity of sound in air, and the characteristics of propellers at tip speeds exceeding the critical ones differ radically from those of the same propellers at tip speeds below the critical.

Airship Design

Data on Aerodynamical Design of Airships. Part II—Motion of Constant Incidence, K. Pediaevsky. (Russia) Central Aero-Hydrodynamical Institute Moscow. Report 178.

THE SECOND portion of an investigation deals with the study of the motion of an airship at constant incidence and contains chapters on pressure plotting on an airship hull; aerodynamical forces and moments on a bare hull; aerodynamical forces and moments on a hull with tail surfaces; efficiency of tail surfaces; determination of flight speed, dynamical overloading and height of dynamical climb; theoretical investigation of pitching moments and normal loads and longitudinal forces on a bare hull.

Some of the methods of analysis in the report are original, developed by the author, such as the method of determination of flight speeds, dynamical overloading and of heights of dynamical climb taking into account the fall of efficiency of the propeller resulting from the decrease of speed and of the side wind and also the method of determining longitudinal loads on an airship hull due to skin friction.

Wing Lift and Drag

The Lift and Drag of a Flat Wing of Infinite Span (Assuming Discontinuous Flow on its Upper Surface). S. A. Chapliguin and A. L. Lavrentiev. (Russia). Central Aero-Hydrodynamical Institute, Moscow. Report 123.

THE AUTHORS deal with two-dimensional flow of an ideal incompressible fluid in which is placed a fixed flat wing. The flow is discontinuous, but the streamlines considered here differ from those in the Kirchhoff-Rayleigh theory in that the fluid flows around the leading edge of the wing, creating a critical point of infinite velocity. The discontinuity takes place at some point on the upper wing surface and on its trailing edge. The problem in its substance is indeterminate, and the point of discontinuity must be assumed. The values of lift and drag will depend on the assumptions and these values based on various assumptions are given in the summary table.

Vibration Measurement

The Electrical Method of Measuring Small Vibrations, and Its Application to the Measurement of Vibrations of Airscrew Blades. J. Obata, Sakae Morita and Yahei Yoshida. (Japan) Aeronautical Research Institute, Imperial University, Tokyo. Report 103. (Published February, 1934).

AN ELECTRICAL arrangement for measuring small vibrations through the medium of a vacuum tube is described. As no electrical oscillation is started in the circuit, the calibration may be kept constant for a much longer period than in a similar arrangement described previously by the authors, in which an oscillating circuit was used. The results of applying this method to the measurement of vibrations of propeller blades are also described.

Seaplane Spinning

Further Experiments on a Model Fairey IIIF Seaplane, A. S. Batson and A. G. Gadd. (British) Aeronautical Research Committee—Reports and Memoranda No. 1564, August, 1932. (Published April, 1934.) 6 pp., 13 figs.

THE EXPERIMENTS described follow those given in R. & M. 1356 (Spinning of a Model of the Fairey IIIF. Seaplane.—H. B. Irving and A. S. Batson), which provides data on the spinning properties of a typical float seaplane. The same 1/15th scale model of the Fairey IIIF. seaplane was used.

The range of incidence over which rolling and yawing moments due to rolling on model, were measured in the former experiment was extended to 69.8°. This included a determination of fin and rudder (6°) rolling moment and control due to rudder set to ± 32.5°. As at 60.9° incidence, fin and rudder moment was again positive (i. e., helping rotation). Curves of rolling and yawing moments due to rolling measured on wing alone (incidence 22.4° to 60.9°), showed marked similarities to those for a R. A. F. 15 biplane, gap = chord, stagger 0°.

Elevator hinge moments were measured at 0° and 30° yaw over a range of incidence approximately 10° to 60° for elevator setting — 35° to + 20°. Hinge moment was not altered greatly by angle of yaw of the model and, with elevators set to trim, was such as to exert a small force on the control column toward the pilots, which decreased as incidence increased.

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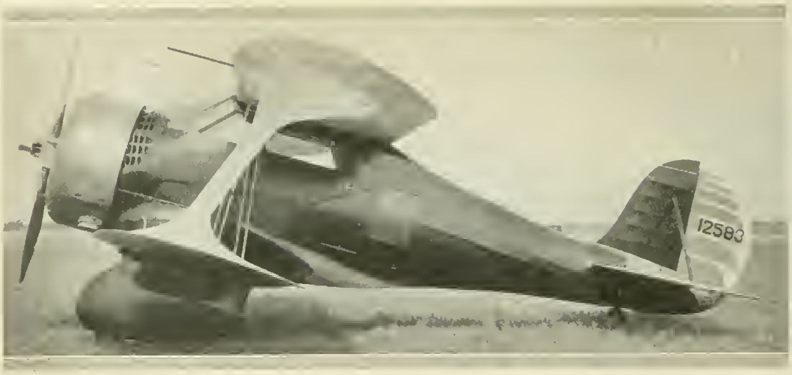


690-Horsepower Beechcraft

● Work has just been completed on another of the aircraft being manufactured by the Beech Aircraft Co., Wichita, Kansas. This newest model, the Beechcraft A-17-F, is a custom built job powered by a Wright Cyclone engine of 690 horsepower and has a top speed of 235 miles an hour, with a cruising speed of 212 miles an hour.

Following the general design of former Beechcraft models, descriptions of which appeared in the December, 1933 and April, 1934 issues of AERO DIGEST, this plane has provision for four passengers in a sound-proofed and ventilated cabin with dual controls. The rear seats are equipped with Beech-designed shock absorbers which relieve fatigue accompanying long periods of high-speed flight, while a roomy compartment provides space for 125 pounds of baggage.

The A-17-F features the inverse wing stagger, streamlined landing gear with semi-retractable wheels, curved safety glass windshield moulded to facilitate better streamlining and decelerators (or wing flaps) to reduce the landing glide.

Equipment consists of the usual flight instruments, ice warning indicator, artificial horizon, directional gyro, ball bank indicator, manifold pressure gauge and an electrical fuel and oil level indicator. Other equipment includes landing and navigation lights, radio beacon receiver, electrically-operated parachute flares, direct electric starter, an engine-driven generator and a Hamilton Standard controllable-pitch propeller.

While the normal non-stop cruising range of the A-17-F is 750 miles, additional fuel tanks may be installed when a greater range is desired. Normal fuel capacity is 155 gallons, 80 octane fuel being consumed at the rate of 70 gallons an hour at top speed and 42 gallons an hour at cruising speed.

Although the A-17-F appears similar to previous Beechcrafts, its principal dimensions have been altered.

Specifications with full load at sea level are as follows:

Specifications

Length	24 feet 2 inches
Height	8 feet 9 inches
Span	34 feet 6 inches
Wing area	323 square feet
Weight empty (depending on equipment)	3,000-3,500 pounds
Useful load (depending on equipment)	2,200-1,900 pounds
Gross weight	5,200 pounds
Wing loading	16.1 lbs. per square foot
Power loading	7.5 lbs. per horsepower

Performance

High speed	235 miles an hour
Cruising speed	212 miles an hour
Landing speed	60 miles an hour
Cruising range	750 miles
Rate of climb	3,000 feet per minute
Service ceiling	32,000 feet

GA-43 Seaplane

● The following additional data concernthe the GA-43-J seaplane, a description of which appeared in the May issue of AERO DIGEST, has been made available by the General Aviation Mfg. Corp.

The plane is powered by a Pratt & Whitney 1690 T2D1 engine rated 660 h.p. at 2000 r.p.m., and is equipped with a Hamilton Standard controllable-pitch propeller and wing flaps. Edo model 9225 floats have replaced the conventional retractable landing gear since Scadta Airlines will operate this plane over its Magdalena River route in Colombia, South America.

With a full load of 10 passengers, 2 pilots and mail and baggage, the plane has a top speed of 160 m.p.h., lands at 65 m.p.h. and cruises at 145 m.p.h.

The 352 cu. ft. cabin is equipped with upholstered reclining chairs and facilities are provided for ventilation with individual passenger adjustment. Behind the cabin, which is 63 in. high and 58 in. wide, is a fully-equipped lavatory, aft of which (and accessible from a door at the lavatory compartment bulkhead) is a 50 cu. ft. cabbage compartment. The pilots cockpit has dual controls; directly underneath it is baggage compartment of 37 cu. ft., which may be loaded from the outside through a door on the side.

The seaplane is of the cantilever low-wing, all-metal type with semi-monocoque fuselage. Center-section of the wing is the same width as the float bracing and is permanently assembled to (and faired into) the fuselage structure. Wing-stub panels are assembled to the center-section by 2 bolts on the front spar and 2 on the rear.

With the exception of the rudder and elevator, which have a fabric-covered metal structure, the tail surfaces are of all-metal design. The fin extends below the fuselage and is provided with a hole for mooring purposes.

A beaching gear, designed by Scadta engineers, is standard equipment and sockets are embodied in the stern end of the floats for beaching gear wheels.

A ladder which folds against the cabin entrance door is used for passengers, while steps on the edge and sides of the fuselage allow the pilot to enter the cockpit from the outside.

Specifications

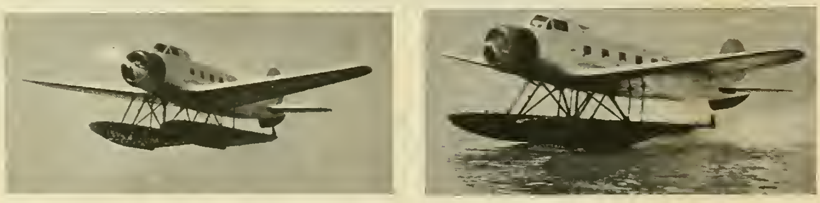
Span	53 feet
Length	43 feet 2 inches
Height overall	13 feet 9 inches
Wing area (including ailerons)	460 square feet
Ailerons	30 square feet
Rudder	16.5 square feet
Elevators	40.4 square feet
Volume of passenger cabin	352 cubic feet

Weights (Pounds)

Weight empty	6005
Useful load	2995
Gross	9000
Gasoline	1056
Oil	97.5
Wing loading	19.5 lbs./square foot
Power loading	13.65 lbs./square foot

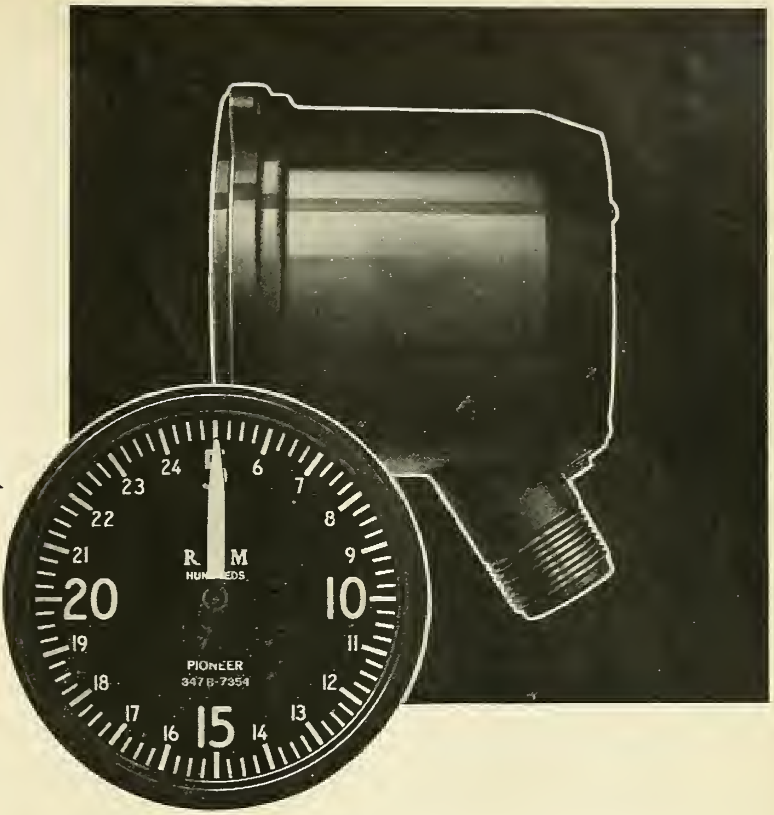
Performance (Sea Level)

Top speed	160 miles per hour
Cruising speed (75% power)	145 m.p.h.
Landing speed (flaps down)	65 m.p.h.
Service ceiling	14,500 feet



General Aviation's Pratt & Whitney-powered all-metal seaplane

TACHOMETER
TYPE 347B



Pioneer Tachometer of the centrifugal type accurately and smoothly indicates the R.P.M. of the engine to which it is attached by means of a flexible shaft. Universally established as the most important instrument of the engine group, the Pioneer Tachometer may be identified on the major portion of airplanes produced within the past ten years ∗ Type 347B retains the original Pioneer design and method of operation. However, many important refinements have been added to increase the efficiency and wearing qualities of this instrument ∗ A new dial with evenly spaced graduations and the new transport pointer, greatly increase the readability of this instrument. ∗ Precision-ground jewels and ball bearings minimize friction and wear, and add to the unusually smooth operation of the actuating mechanism ∗ Carefully selected materials, precision workmanship, rigid vibration and temperature tests...all are combined to assure perfect operation and constantly satisfying service ∗ Pioneer Tachometer 347B embraces in proper balance, all the performance and wear-resisting features for which Pioneer Instruments are famous.

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STANLEY H. EVANS, A.F.R.Ae.S., M.I.Ae.E.

Dean of Engineering, Curtiss-Wright Technical Institute

● It has been recognized for many years that a large proportion—probably the majority—of airplane accidents are caused by stalling near the ground, very often, when after engine failure in taking off, the ship loses flying speed due to loss of lift and generally spins out of control. However perfect the design of the conventional airplane may be today, it still requires a certain height in which to recover from this spin, the actual amount of the fall varying according to the type of ship. The form of lateral control which has become almost universal, i.e., the hinged trailing edge flap, or aileron, becomes very weak, or even totally ineffective at the stalling angle, since the wing has reached its lifting limit. Thus, in pulling down the aileron on one side, instead of increasing the lift as intended, the main result is to increase the drag on that side, which tends to retard the wing and so swing the ship round in the opposite direction to that desired, thereby precipitating the well-known phenomenon of "auto-rotation," or spinning. Any device, therefore, which helps to increase the lift at high angles of attack and so reduce this type of failure, is worthy of serious attention.

Such a device, which attacks the problem at its source, is the Handley Page slotted wing invented in England some 15 years ago and since then the subject of much experimental research both by the Handley Page company and the British Air Ministry. For some curious reason—probably connected with the vexatious question of patent royalties—the practical application of this discovery has been almost entirely neglected by American constructors: neither has much useful or readable information been published on its underlying theory, mechanics, or construction. Hence, the writer, as the result of first-hand experience gained during his connection as technical assistant to the inventor, is presenting the case for the slotted wing.

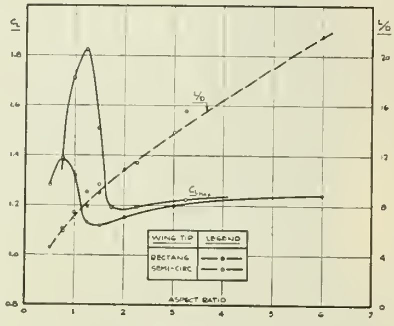
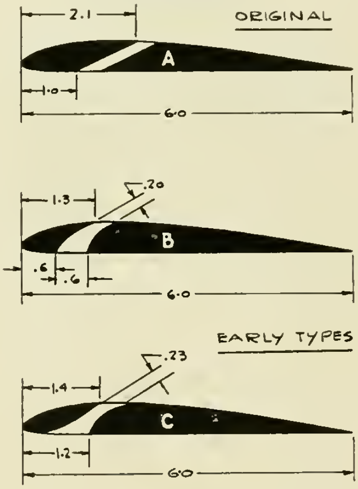


Fig. 1. Maximum lift vs. aspect ratio

Origin of the Slot

The story of how the idea of the slotted wing originated in the mind of the inventor is little known outside of British technical circles and perhaps not at all in this country. It is a record of inspiration in the first place, followed by years of painstaking research both in the wind-tunnel and on the flying field for confirmation in full-scale flight tests; a program directed towards solving the mystery, of why an airplane wing stalls or "burbles" after reaching a certain angle of attack, and how to prevent, or at least delay, the objectionable phenomenon of burbling.



Early forms of transverse slot, showing steady improvement from original form "A"

It is known that the lift and drag of a wing are not dependent on the airfoil section alone. For instance, other geometrical characteristics (notably the plan form and aspect ratio) influence the aerodynamic properties to a marked degree, and different types of airplanes offer a wide range in aspect ratio. Thus, a racing airplane, designed solely for speed, is generally characterized by a low aspect ratio, between 5 and 6, whereas the light plane or glider is much higher and in the case of the latter may even reach as high as 20.

Mr. Handley Page, one of the outstanding pioneers of British aviation, commenced experiments with inherently stable monoplanes of bird wing plan form, in a factory (the first in Great Britain for such work) established on the outskirts of London in 1908. A few years later, in 1911, he reported in a paper to the Royal Aeronautical Society that: "The critical angle at which the live air leaves the upper surface of the wing is reached earlier in the case of high aspect ratio airfoils, and the latter accordingly do not attain such high maximum values of lift as those of lower aspect ratio. With wings of high aspect ratio there is not the same facility for the feeding in of fresh air at the sides to act as a link between the wing and live stream, and therefore the live stream leaves the upper surface at an earlier stage than in the case of the wing of lower aspect ratio."

This statement was supported by a series of tests on airfoils of varying aspect ratio, ranging from 1 to 6, showing that the square airfoil (i.e., an aspect ratio of 1 with chord equal to span)

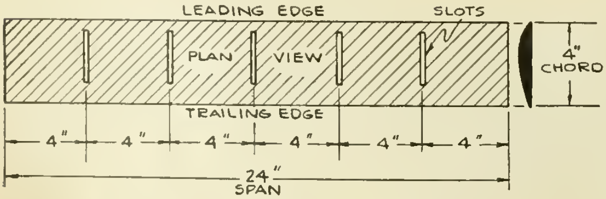


Figure 2. Longitudinal slot (abandoned)

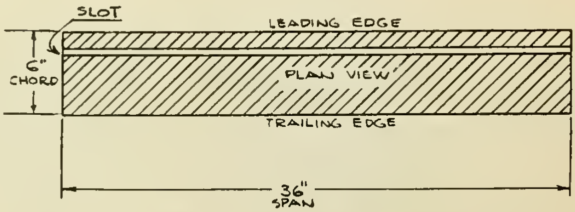


Figure 3. Transverse slot (developed)

continued lifting until 40° angle of attack, whereas the airfoil of aspect ratio 6 burbled earlier than 15° and developed considerably less lift. Recent tests of the N.A.C.A. in this country (see fig. 1) indicate that this result is somewhat misleading, for it is true only in the case of square or nearly square plan forms—and for the reason as originally postulated by Handley Page in 1911. Beyond an aspect ratio of 2, the maximum lift again rises with increase in the ratio. Further, it must not be forgotten that the lower aspect ratios are associated with higher drags, hence their aerodynamic efficiency throughout the normal flying range is decidedly inferior. In fact, if it were not for the structural difficulties of supporting the longer span in the case of higher aspect ratios, it would pay to make this ratio as high as possible in the interests of all-round efficiency. With light planes and gliders, where the distribution of load along the span is small, we see the reason then for the high aspect ratios of current practice. Nevertheless, the unexpected result of Handley Page's square airfoil experiments was the foundation several years later, in 1919, from which the slot idea originated.

Evolution of the Slot

Arguing from the results of the square airfoil, the next step was to take an airfoil of aspect ratio 6 and convert it into a series of six square ones by cutting five parallel slots longitudinally along the chord, as shown in fig. 2, aiming to delay the stalling angle and so realize a higher maximum lift. From the actual test a slight improvement was noticeable, though not comparable with that predicted from the square airfoil alone.

The longitudinal slot was accordingly abandoned in favor of a transverse slot dividing the wing along the span, as shown in fig. 3, instead of along the chord, and this produced a really marked improvement, despite the fact that the parallel shape of slot shown in sketch A was of very rudimentary form. From subsequent experiments, however, it was clear that the transverse slot opened up a new field of wing development, besides providing new evidence into the cause of burbling at high angles of attack. Since then the investigation of the correct shape of slot, its angle relative to the main wing, the size of the openings on upper and lower surfaces, along with many other details, have been the subject of exhaustive research to obtain the best combination. Sketches B and C (fig. 3) show further steps in the early evolution of the leading edge type of slot, an increase in maximum lift of about 25% over the basic unslotted section, being obtained with C. Later, improved types of single-slot designs increased this figure still further to more than 60% additional lift.

Further investigation with multiple slots produced some remarkable increases both in maximum lift and the critical angle at which it occurs. Thus, in fig. 4, is shown a multi-slotted arrangement having six slots and developing a maximum lift nearly three times that of an orthodox section such as Clark Y, and it attains this remarkable value by postponing the stalling angle until 45° The multi-slot arrangement has many constructional difficulties to overcome before being considered outside of the laboratory and within the realm of practical engineering design. It should be realized in this connection that the open slot, while considerably augmenting the lift, also seriously increases the drag at low angles, hence a closing device is necessary to maintain a high-speed section at small angles of attack. It is tolerably certain, however, that the ingenuity of the engineer will eventually solve the design problem of the multi-slotted wing. Apropos of which it is worth recalling that the retractable landing gear was thought by some designers to present insuperable mechanical difficulties a few years back, while today it is rapidly becoming a commonplace feature of proved merit.

Space does not permit describing

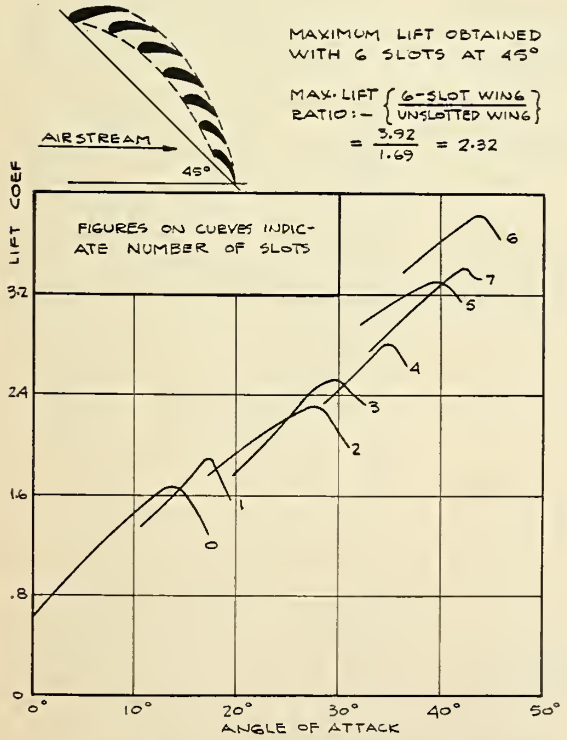


Figure 4. Graph showing lift obtained with multiple wing slots

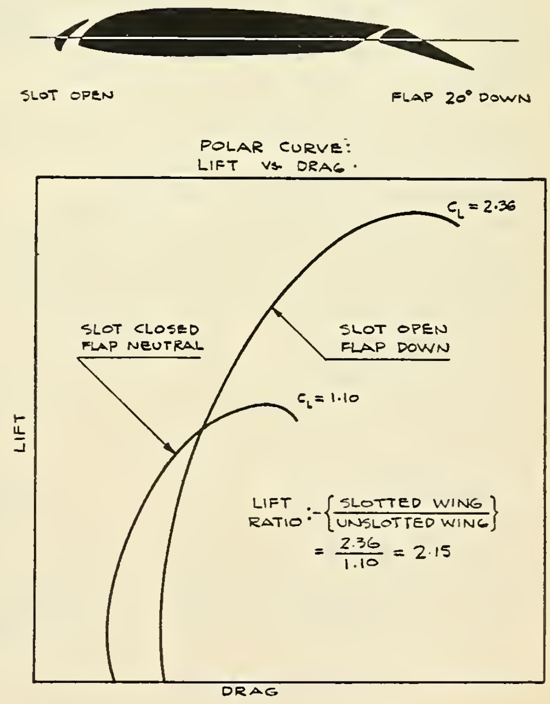


Figure 5. Graph showing lift obtained with wing slot and flap

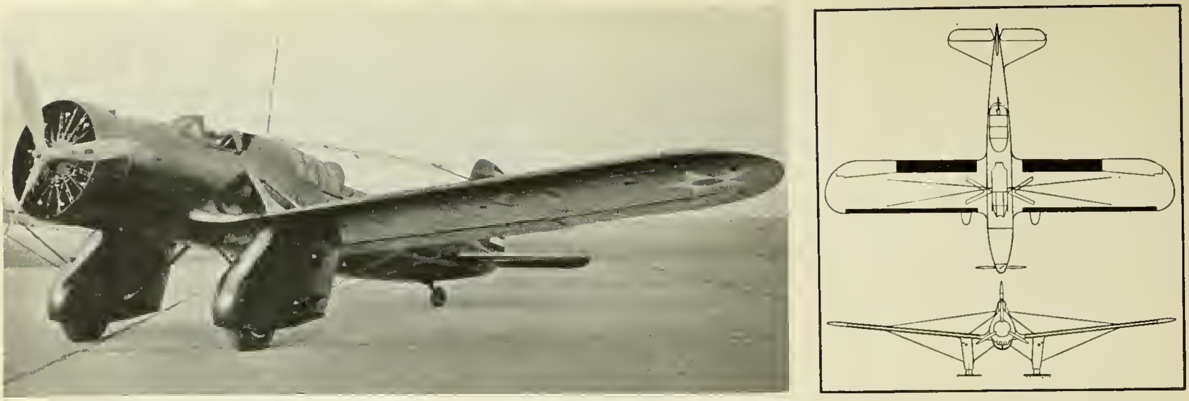


Figure 6. Curtiss A-12 attack with slots and flaps and diagrammatic sketch of the Curtiss A-8 showing slot and flap arrangement

the many interesting metamorphoses through which the slotted wing has passed in its 15 years of research; a period of experimentation, during which many combinations were tried out and abandoned as new data were forthcoming from the wind-tunnel and the field. One further arrangement should be mentioned, however, as it probably represents the most widely used and practical application of the slot today. This is the addition of a rear slotted flap at the trailing edge, intended to increase the lift still further when coupled up to the leading edge slot. Fig. 5 shows that when the front slot is opened, the rear slot is likewise open with the flap in the depressed condition. This combination will produce an increase in lift of over 100%; i.e., twice the lift of the basic unslotted section without slots or flaps. Furthermore, it obviates the employment of a high landing gear which otherwise becomes necessary in the case of the front slot alone, due to the higher angle at which the maximum lift is developed. The addition of the slotted rear flap, therefore, enhances the value of the front slot and establishes the combination as a thoroughly practical installation. A modern military example of this arrangement is illustrated in fig. 6.

Principle of the Slot

Various theories have been advanced from time to time seeking to explain the aerodynamic principle underlying the remarkable gain in maximum lift attained by the slotted wing. To offer a tenable explanation without recourse to mathematical interpretation, we must return to the conventional airfoil, studying the airflow over its surface in our search for the cause of burbling as the stalling angle is approached. The following outline has been widely accepted by many workers in this field.

From visual observation of airflow patterns, it is known that as an airfoil approaches the wind at a small angle of attack, the particles of air flow across the upper and lower surfaces in a smooth manner, the airstreams separating smoothly at the leading edge and rejoining each other at the trailing edge without much disturbance. This type of flow (*Streamline*) is indicated by diagram A of fig. 7. It will be seen that the particles of air closely follow the contour of the airfoil, resulting in a curved path directed downwards at the trailing edge; also at the upper leading edge, the curvature is very steep, hence the air velocity reaches a maximum over this portion and the suction is greatest in intensity.

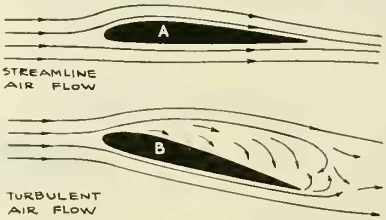


Figure 7. Streamline and turbulent airflow

As the angle of attack increases, the curvature of the streamlines becomes sharper and the downward angle at the trailing edge increases, so giving rise to the increase of lift with increasing angle. The smooth character of the *streamline* flow, however, is beginning to change into regions of ***turbulent*** flow over the upper rear surface of the wing, owing to failure of the air to make the more abrupt turn now presented by the leading edge. Baldly speaking, the air particles cannot "hug" the sharp radius and are skidding outwards rather badly, somewhat like a dirt-track automobile racer taking a corner too fast. Ultimately, when we reach the critical angle or burble-point (usually around 16° to 20° angle of attack) there is a definite alteration in the type of flow, the streamlines break away from the upper surface and cause a "dead-water" region of turbulent flow, as depicted in diagram B of the same figure. From the violent turbulence which has set in, the suction then breaks down over the upper surface, and causes the collapse of lift at this angle.

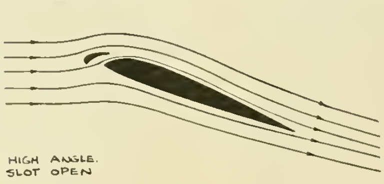


Figure 8. Slot closed and open

Slot Supplies New Energy

So much for the ordinary airfoil. Now consider the introduction of a correctly shaped slot somewhat on the lines of a venturi-tube, situated at the leading edge, as in fig. 8, where it can control the air flow over the upper surface at high angles. Note particularly that the small leading airfoil thus formed is still set at a small angle to the airstream in its immediate vicinity, even though the main portion is beyond the usual stalling angle of an unslotted section: accordingly the flow is still in smooth streamline motion. Moreover, the pressure on the under side of the wing combined with the suction on the upper surface, causes a jet of air to flow through the open venturi slot, discharging at very high velocity along the upper surface of the main wing and so encouraging the upper stream to continue flowing smoothly towards the trailing edge without much disturbance. In other words, the open slot supplies fresh energy to the flagging stream, coming as a tonic at a crucial time and blowing away the vortices which would be produced by the dead-water region already mentioned. The use of the slot, therefore, postpones the stalling angle by increasing the range of steady streamline flow, the wing continuing to increase in lift, commensurate with the gain in angle obtained. Up to certain limits, the greater the number of slots opened, the more is this angular range extended, as reference to fig. 4 graphically shows.

Application to Design

In the first full-scale experiments the slot was permanently left open, the small leading airfoil being rigidly supported on brackets extending forward from the front spar of the main wing. In more recent designs, however, the slot is made variable at will, provision being made to open and close the leading element (or slot airfoil) by suitable mechanism, such as parallel links or sliding rollers. This is essential to obtain the best combination of high lift and low drag in one wing section, for as stated previously, the open slot (or gap) is detrimental in the high-speed condition owing to its increased drag at low angles of attack. Hence in normal flight we must arrange to close this gap by pulling back the small slot airfoil snugly against the leading edge of the main airfoil, so converting it to the basic section once more.

The most recent development in England now provides for automatic operation of the slot airfoil, thereby eliminating the weight and complication of the mechanically-operated gear, since it has been found practicable to utilize the air forces themselves to open and close the slot at the correct angle of attack. Thus in taking off and landing, when the angle is large and a high lift is desired, the slot is maintained fully open by the air force pulling it forward, whereas in normal or high-speed flight with the angle of attack below 8° or 10°, the resultant air force on the slot airfoil changes direction and is pushing this element hard against the leading edge of the main wing, a position favorable for low drag and high efficiency. This feature of automaticity is a valuable characteristic of the front slot when interconnected with a rear flap, since the resultant air force on the leading edge may be employed for operation of the flap, thus relieving the pilot of this operation and also saving a certain amount of weight in the operating gear. The writer believes, however, that a manually-operated locking device, to hold the slot airfoil in either extreme position, is a desirable safeguard for the automatic type.

The large increase in lift from the slot action may be utilized by the designer in several ways. We have noted that the installation of a slot-plus-flap arrangement, such as fig. 5, will more than double the maximum lift of the original unslotted section, and with the same gross weight and wing area, will reduce the stalling speed by some 30%, reduce the run and also improve the take-off, with corresponding increase of safety. Or, we can maintain the original landing speed and cut down the wing area (also the other dimensions) and so improve the top speed. Judging from experience with both types, a compromise between the two extremes will be found the most beneficial. Granted that the airplane is expressly designed for the slotted wing *ab initio,* the fullest advantage being taken of the reduced over-all dimensions possible, the slotted airplane is superior not only in performance and maneuverability by reason of smaller size and decreased weight, but in control and therefore safety, due to the increased angle of attack at which it can be flown without danger of spinning.

Comparative performance characteristics for a typical airplane project are shown in fig. 9, illustrating a pair of design studies for a two-seater monoplane of 100 h.p. and about 1600 lbs. gross weight. Design A represents the orthodox fixed wing arrangement, while B is a slotted wing layout to the same specification. Both cases have been carefully predicted by the use of Oswald's performance parameters and charts (reference N.A.C.A. Technical Report 408), so the results are believed comparable. A fully retractable landing gear has been assumed for both cases and the maximum lift coefficient of 2.8 absolute for the slotted design is a conservative figure well within the experimental full-scale results obtained for tapered airfoils. It is not by any means the maximum obtainable by the optimum combination of front slot and rear flap, but a reasonable allowance has been deducted for the usual loss of flap area due to ailerons over the outer half of the wing.

CHARACTERISTICS			Ⓐ FIXED	Ⓑ SLOTTED
MAX. LIFT COEF.	$C_{L_{MAX}}$	(ABS)	1.5	2.8
GROSS WEIGHT	W	lb.	1600	1550
RATED POWER	P	BHP.	100	100
WING AREA	A	ft.^{2}	166	106
ASPECT RATIO	R	S^2/A	7.0	9.7
WING LOADING	W/A	lb. ft.^{2}	9.65	14.6
POWER LOADING	W/P	lb. H.P.	16.0	15.5
COMBINED LOAD^G	—	—	154	226
MAXIMUM SPEED	$V_{MAX.}$	mph.	150 } S.R.	162 } S.R.
MINIMUM SPEED	$V_{MIN.}$	mph	50 } 3.0	45 } 3.6
INITIAL CLIMB	C_o	f.p.m.	765	830
SERVICE CEILING	H_s	ft.	17,800	18,500

Performance Comparison

The tabulated figures show that the slotted airplane has gained at both ends of the speed range, the top speed increasing from 150 to 162 m.p.h., while the stalling speed has dropped from 50 to 45 m.p.h., an overall increase of 17 m.p.h. Moreover—and this is significant—despite the heavy increase in wing loading from 9.6 to 14.6 lbs./sq. ft., the initial climb off the ground with slot closed has also been increased from 765 to 830 ft. /min. for two reasons: a decrease in gross weight from 1600 to 1550 lbs. (by reason of the decrease in wing area and major overall dimensions of the airplane) and because of the improvement in aspect ratio from 7.0 to 9.7 made possible with the slotted design.

The present results are plainly indicative of the aerodynamic improvement obtainable by the use of wing slots when incorporated in the design from the start. Too often in the past the installation of slots has been discredited by their unfortunate application to existent designs where they have been added as an afterthought, thereby penalizing both the slot and, as often as not, the original airplane. The invention of the slot remains one of the outstanding milestones along the path of aerodynamic progress, and the next few years should witness its adoption on many types of aircraft.

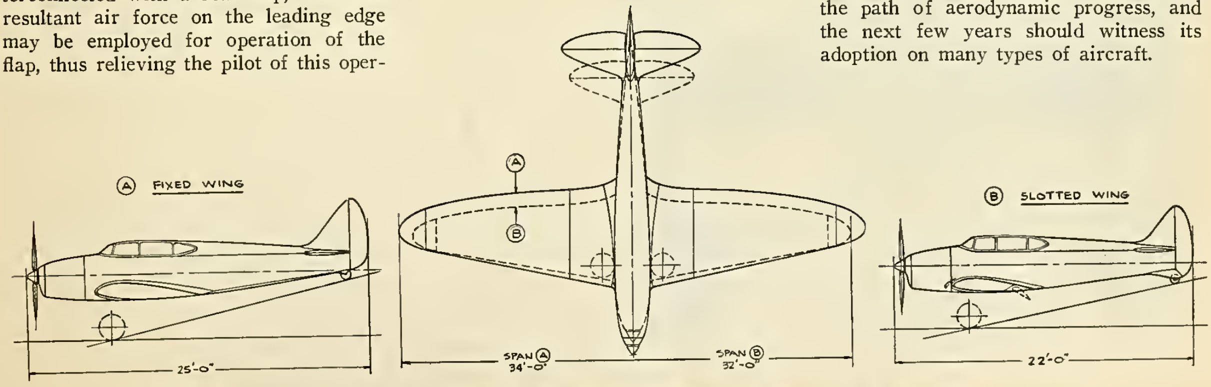


Figure 9. Design studies of fixed and slotted wing monoplanes, illustrating comparison of sizes and characteristics

Allan Lockheed's Twin-Motored *Alcor*

● Demonstration flights of the Duo-6, a twin engined cabin monoplane designed primarily for feeder-line work by Allan Lockheed of the Alhambra Airport and Air Transport Co., proved that the ship could take off and climb at the rate of 400 feet a minute from sea level on one engine. In a test at Mines Field in March, and another test at Floyd Bennett Field last month, the starboard propeller was removed and the ship took off in a 1200-foot run, developed a speed of 130 miles an hour in horizontal flight and was put through a series of wing overs, left and right, and handled the same as a conventional single-engined ship.

The cantilever wing and fuselage are of plywood structure, as is the cantilever tail group. The wing curve used is a modification of the M-6 and the wing is tapered in plan form as well as in section. Ailerons are inset, providing adequate lateral control at low speed while the stabilizer is adjustable during flight.

The cabin has a length of 8 feet 10 inches, is 51 inches high and 40 inches wide, giving a displacement of 157 cubic feet. Space for baggage is 30 inches long, 42 inches high and 18 inches wide, the displacement being 27 cubic feet. An auxilliary baggage compartment has a displacement of 13 cubic feet, thereby providing a total space of 40 cubic feet for baggage. The Duo-6 can be arranged to accommodate from 4 to 8 persons, and the present ship has seats for 4 in addition to the pilot and co-pilot. Visibility from the pilots' compartment is particularly good because of the arrangement of the engines and there are no obstructions to restrict the view from the passengers' cabin. Entrance is had through a door at the rear of the cabin, and seat back and the rear seat fold so as to permit easy entrance and exit. The door is rendered air-tight by the incorporation of rubber weather stripping in the frame, with non-shatterable glass used throughout.

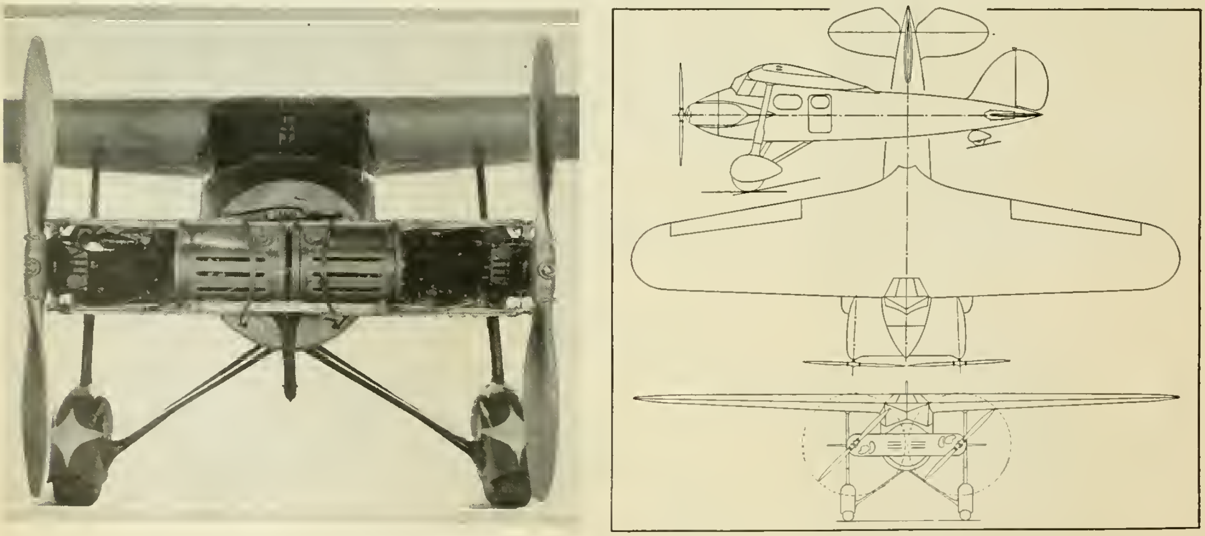
A heater is provided for the cabin, and instruments include manifold pressure gauges, oil pressure gauges, oil temperature gauges, tachometers, altimeter, air speed indicator, bank and turn indicator, compass, rate of climb indicator and clock.

Hydraulic shock absorbers are incorporated in the vertical struts of the landing gear and extend to the front main beam of the cantilever wing. Landing wheels with 9.50 by 12 tires are covered with streamline pants. The tail wheel also is streamlined.

The power plant consists of two air-cooled 6-cylinder Menasco Buccaneer engines delivering 230 horsepower each, and set in horizontal position with the hubs 93 inches apart. The Hamilton-Standard controllable-pitch metal propellers are 7 feet 6 inches in diameter and Eclipse electric starters are provided.

The engines are supported in full cantilever position on built-up hollow welded metal tapered mounts. Oil tanks are built into the space between the engines with cooling louvres in the nose of the ship. The exhaust is through a single manifold leading under the fuselage. Engine vibration is minimized by the fact that the vibration impulses of one engine oppose those of the other, although the engines are particularly smooth when operated independently. The entire engine group with its oil tanks may be removed as a unit, the installation being mounted on the firewall bulkhead with the same mountings as used for a single engine.

The Menasco Buccaneer C-65 is a supercharged version of the B-6, a 6-cylinder, in-line, air-cooled engine. The bore is 4.50 inches and the stroke 5.125



Front view with cowling removed and outline drawings of Allan Lockheed's Duo-6 Alcor inches; displacement, 544 cubic inches. Compression ratio, 6:1. Blower ratio, 10.4:1. Weight (dry) 418 pounds.

Specifications

Span	42 feet
Length over all	28 feet 6 inches
Chord at root	8 feet 8 inches
Chord near tip	5 feet 2 inches
Weight empty	2,665 pounds
Useful load	2,045 pounds
Pay load	1,200 pounds
Weight fully loaded	4,710 pounds
Engines (2) Menasco, each	230 horsepower
Wing loading	16.7 lbs. per sq. ft.
Power loading	10.2 lbs. per h.p.
Gasoline capacity	100 gallons
Oil capacity	10 gallons
Fuel consumption (cruising)	20 gals. per hr.
Oil consumption (cruising)	1 quart per hour
Cruising range	700 miles
Landing speed	57 miles per hour

Performance (Both Engines)

Maximum speed	183 miles per hour
Cruising speed	157 miles per hour
Climb at sea level	1,400 feet per minute
Time of take-off at sea level	9 seconds
Ceiling with full load	19,000 feet

Side view of the twin-motored Lockheed Alcor feeder-line plane

Performance (One Engine)

Maximum speed	125 miles per hour
Cruising speed	100 miles per hour
Climb at sea level	400 feet per minute
Ceiling	6,400 feet
Length of take-off at sea level	1,200 feet

• Recent Aeronautical Patents •

The following patents of interest to readers of AERO DIGEST recently were issued from the United States Patent Office and compiled by R. E. Burnham, patent and trade-mark attorney, 511 Eleventh Street, N. W., Washington, D. C.

Propellers. Clinton H. Havill, South Orange, N. J., assignor to Eclipse Aviation Corp. (1,952,066; 1,952,798; 1,952,799; 1,952,800; 1,952,801; and 1,952,802)

Propeller. Martin Mansson, East Orange, N. J., assignor to Bendix Research Corp. (1,952,812)

Testing apparatus. Alexander Procofieff Seversky, New York, N. Y., assignor to Seversky Aircraft Corp. (1,953,045)

Aircraft antenna weight. Clarence W. Burger, Cherrydale, Va., assignor to National Electric Supply Co., Washington, D. C. (1,953,071.)

Aircraft. Hugo Junkers, Dessau, Germany. (1,953,234).

Mount for aerial cameras and method of aerial photography. Frederick W. Lutz, Floral Park, N. Y., assignor to Fairchild Aerial Camera Corp. (1,953,304.)

Automatic variable-pitch propeller. Robert L. Kelm, Lake View, N. Y. (1,953,682.)

Balanced variable-thrust propeller construction and centrifugal variable-thrust mechanism. Isidor B. Laskowitz, Brooklyn, N. Y. (1,953,963 and 1,953,964.)

Aircraft. Hans G. E. Roth, New Rochelle, N. Y. (1,953,977.)

Rotor head for aircraft. Thomas E. Moodie, Atlanta, Ga. (1,954,533.)

Aircraft. Francis T. Courtney, New York, N. Y. (1,954,727.)

Automatically-adjustable wings and blades for helicopter and propeller screws. Rudolph Chillingworth, Brooklyn, N. Y. (1,954,862.)

Gyroscopic inclinometer for aircraft. August Hoffmann, Eisenbach, Germany. (1,954,998.)

Fire extinguisher for aeroplanes. Sandy Pallotta, Youngstown, Ohio. (1,955,086.)

Airplane. Harold A. Hicks, Detroit, Mich., assignor to Ford Motor Co. (1,955,185.)

Aircraft, including means for entering and leaving same. Igor Sikorsky, College Point, N. Y., assignor to Sikorsky Aviation Corp. (1,955,256.)

Aerial flight instrument. Carl J. Crane and William C. Ocker, Brooks Field, Tex. (1,955,488.)

Flying machine. David K. Jette, Midskog, Sweden. (1,955,501.)

Aircraft control. Frederick C. Kusse, Chicago, Ill. (1,955,921.)

Airplane. Jacob Wagner, Portland, Oreg. (1,956,054.)

Adjustable propeller. Thomas A. White, Mansfield, Ohio. (1,956,184.)

Retractable landing gear. Socratis H. Capelis, El Cerrito, Calif. (1,956,313.)

Flotation gear for aircraft. Reginald F. Dagnall and Alan H. Reffell, Guildford, England. (1,956,494.)

Non-dirigible aircraft. Ervin E. Joy, Portland, Oreg. (1,956,508.)

Device for stabilizing airplanes by means of wind vanes. Louis Constantin, Paris, France. (1,956,755.)

Wing structure. Edmund B. Carns, Lincoln, Neb., assignor to Cairns Development Co. (1,956,823.)

Airplane spray equipment. Otto Morgensen, Jr., Modesto, Calif. (1,957,075.)

Aerial navigation machine utilizing a light gas and device for throwing anchors from aircraft. Etienne E. Oehmichen, Valentigney, France. (1,957,149 and 1,957,285.)

Helicoplane and allied aircraft. Joseph P. Leray, West Warwick, R. I. (1,956,277.)

Air control apparatus (airplane). Albert O. Price, Leesville, Ohio, assignor to Priceler Corp. (1,957,413.)

Seaplane. Harry H. Semmes, Chevy Chase, Md., assignor to Bendix Aviation Co. (1,957,675).

Airplane control side propeller mechanism. Frank L. Szafranski and John Rogozynski, Detroit, Mich. (1,957,739).

Aircraft. Edward B. Wilford, Merion, Pa. (1,957,813).

Adjustable propeller. Charles B. Hebbard, Joplin, Mo. (1,957,887).

Aircraft and propulsion means therefor. Christopher Marguglio, New York, N. Y. (1,957,896).

Airplane take-off accelerator. Charles A. R. Benedict, Edwardsville, Ill. (1,957,931).

EDITORIALS

(*Continued from page* 21)

while in the Air Mail Service giros might be utilized to deliver mail to roof tops and in flying in all kinds of weather. As for low-priced aircraft for private flying, many authorities agree that the autogiro is a good possibility to fill the bill—but it must first be developed to the point where it is suitable for quantity production.

A very small amount of government cooperation (compared with that granted the airplane or the airship) will perhaps result in an astonishingly rapid growth of the civil autogiro industry, and given cooperation, autogiro speed and performance will constantly improve.

Engine Cooling Improved by the Use of a Controllable Cowl

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● Studies of aircraft engine cooling control by modifying NACA cowls, were made by Rex B. Beisel, A. Lewis MacClain and F. M. Thomas of the Chance Vought Corp., Pratt & Whitney Aircraft Engine Co., and United Aircraft & Transport Research Division, and presented by Mr. Beisel at the 1934 annual meeting of the S.A.E. in a paper entitled "The Cowling and Cooling of Radial Air-Cooled Aircraft Engines".

It was known that engine cooling varies considerably with changes in the condition of flight due to variations in airspeed and power, and extensive research disclosed that the drag of an engine with its cowling is a direct function of the difficulty of cooling it. In an endeavor to improve cylinder head and base cooling with a minimum of drag, different cowl arrangements were designed and tested.

One of the first was a fixed flared flap which, when incorporated at the trailing edge of the cowl-skirt, showed cooling improvements of 38° and 24° F. on the cylinder heads and bases respectively and a loss in speed of 3 m.p.h. The use of this device for reducing cylinder head temperatures led to the development of the idea of providing regulated temperature control by a cockpit-controlled continuous trailing-edge flap on the cowling.

Increases in specific power and the use of controllable pitch propellers have made the cooling problem acute, and aircraft designers have been forced, in their efforts to improve performance, to accept the disadvantages of more difficult cooling while endeavoring to improve the airplane drag characteristics.

This increasing difficulty of cooling engines may, if not properly allowed for, result in an undereestimate of the value of controllable air-cooling. There would be a reduction in expected climbing performance if a flapped cowl were used on an engine that formerly, at a lower power-rating, cooled satisfactorily without it. This is shown by the increases in drag resulting from opening the flap; but, this is not a fair evaluation of the variable cowl unless the resulting improvement in cooling is taken into full account. This method of evaluation, is apt to be confusing and a more direct presentation of the overall improvement can be shown by considering that the flap is used to maintain constant cylinder temperatures under all flight conditions. This method of comparison is fair and it is almost obvious at the outset that it will show improvements in performance.

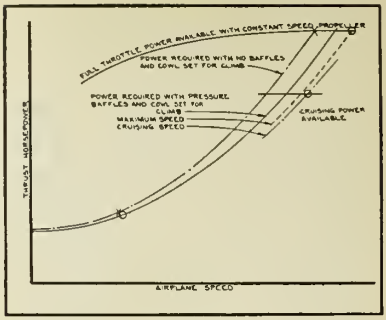
Cowl flap open (left) and closed (right)

Requirements for Cooling

For convenience, the "power available" curve in the diagram is drawn for a variable-pitch propeller which permits the engine to operate at constant speed for all full-throttle conditions of flight. The "power-required" curve is for an airplane equipped with an outer cowl which permits adequate engine cooling in climb. As the airplane speed is increased with this same cowling, the heat to be dissipated through the fins remains constant; and yet the amount of air flowing over the fins, and hence, the heat dissipated therefrom, increases considerably. The cylinder temperatures obtained at level-flight maximum speed are thus lower than those with the same cowl and the same power at climbing speed. If satisfactory temperatures in climb are assumed then the temperatures at maximum speed are lower than necessary; in other words, the drag required to cool the engine is greater than necessary.

If the cowl is altered so that airflow is reduced just sufficiently to cool the engine at maximum speed, but not in climb, there will be a reduction in airplane drag if both cowls are reasonably well-designed. The next lower power-required curve in the diagram illustrates the change in drag of the airplane due solely to this cowl adjustment.

At cruising speed the second cowl furnishes more cooling than is required to maintain satisfactory cylinder temperatures. The results are that the heat dissipation is reduced roughly directly as the air speed, while the heat to be dissipated is reduced approximately as the cube of the air speed. In other words, the cowl which gave just adequate cooling at maximum speed furnishes an unnecessarily large amount of airflow, and hence drag, for cruising speed. Therefore a further gain is to be obtained from designing a third cowl, especially for the cruising condition. The approximate relationship among these three cowls is shown in the diagram.



Effect of a flapped cowl on performance at constant altituda and cylindar temparature

These cowls can be considered as three different positions of an adjustable flapped cowl. While there might be slight improvements in specially-designed fixed cowls over those of a flapped cowl at extreme positions, tests showed this to be unlikely and that the variable cowl efficiently does the work of three or more well-designed cowls. The uppermost curve in the figure, showing the power required without close baffles and with a fixed cowl set to cool in climb, completes the illustration of the overall gain due to using the entire baffling and cowling system.

Installation on Vought V-70-A

The possibilities of the controllable flapped cowl were sufficiently apparent to warrant the installation of such an arrangement on a Vought V-70-A airplane. The accompanying illustration shows this installation with the flaps in the full-open and in the closed positions.

Level-flight tests were conducted at a constant density-altitude above sea level and at a constant engine power less than rated to eliminate the effect of density upon heat dissipation and airplane drag. The use of a power less than rated (for convenience of test procedure) resulted in speeds less than the maximum for this airplane. To check the speed effect of opening the cowl, the airplane was flown full-throttle over a speed course.

Tests showed changes in cylinder temperatures and changes in airplane speed resulting from changes in flap angle at constant engine-power. Since there was constant power in all cases, the heat to be dissipated by the fins was also constant and changes in cylinder temperatures were due entirely to changes in flow through the baffles. Increasing the angle of the flap definitely increased the flow despite the fact that the flow due to flaps alone was reduced by a drop in airplane speed. The drop in air speed correspondingly resulted from progressive increases in drag as the flaps were extended. The flight tests showed a large and continuous increase in airflow through the engine accompanied by some increase in drag as the flaps were extended. The flight tests also show that small deflections of the flap from 0°-setting improve cooling with little loss in speed and that the drag increases at a faster rate as the flap is extended. Further improvement in cooling at an increased rate (based on flap angle) could have been obtained by further expansion of the flaps beyond the 20° used.

An examination of the dimensional changes resulting from extending the flap 20° indicates that, even with flap extended, the cowl is one that should compare favorably with fixed cowls designed to take care of a difficult cooling problem. The total cowl length is 32 in., the last 9 in. being the chord of the flap. Extending the flap to 20° increases the radius of the trailing-edge skirt only 3 in. and its angle to the thrust line becomes 15°. The gill opening is increased from about 3 in. to 5 in. (reasonable for a fixed-cowl installation which is difficult to cool).

Flight Test Effects on Performance

Examination of the climb curves in which the engine powers are comparable to the usual relationship between climb and high-speed conditions of flight, shows the change in cylinder temperatures between 0° flap and 20° flap-setting is 50° F., for heads and 25° F. for bases. At the same time, the difference in temperatures at high-speed for 0°-flap and 20°-flap, is 60° F. for heads and 30° F. for bases. The advantage of substituting a controllable flap on an airplane requiring, for adequate cooling in a climb, a fixed-cowl arrangement corresponding in effectiveness to a 20° flap-setting on the V-70-A, is apparent from these flight tests. With the controllable cowl, the flap should be set at 20° for climb to obtain the required cooling and pulled in to 0° for high speed. The engine temperatures at climb and high speed will be about the same, and the gain in top speed is 6 m.p.h. for an airplane whose speeds are comparable to the V-70-A.

The question arises, however, of the effect on rate of climb when extending the flaps. The climb data obtained in connection with temperature readings have been plotted and the flight-test rates of climb obtained at sea level are: 1720 ft./min. with 0° cowl-angle and 1660 ft./min. with a 19° cowl-angle.

Decrease in climb attributed to the flap is only 60 ft./min., or 3 per cent. The loss in rate at higher altitudes remained about the same, but at 5000 ft., the temperatures began to drop. By gradually pulling in the flap as altitude increases, a point will be reached where the flap is at 0° angle, with no loss in climb.

Uniform Cooling in All Seasons

It should be pointed out that, even in the experimental set-up, the advantage of the flaps is shown in that the V-70-A can not be expected to cool entirely satisfactorily in a full-power climb at 90° F. ground temperature without using the controllable flap. The average head temperatures for 90° strut air temperature can be expected to run up to 535° F. with 0°-flap but can be dropped to 485° by extending the flap to only 20°. At full speed in level flight, on the other hand, with flaps closed, the head temperatures at 90° strut will be about 515°F. Opening the flap slightly at this high ground-temperature will reduce the temperature to 500° F. with a loss in speed of 1 to 2 m.p.h. Rather than indicating an undesirable cowl arrangement at the 0°-angle setting, it appears on the contrary that, because cruising permits lower flap-setting than maximum speed, the arrangement is really desirable; for example, the most efficient basic arrangement (near 0°-flap) that will give the required cooling at cruising speed at high summer air-temperatures.

Not only can the flap be controlled to improve airplane performance during winter in comparison with summer operation, but the temperature of the engine can be adjusted at will to operate, regardless of air temperature, at its most efficient temperature. During recent cross-country flights of the V-70-A, it became instinctive for the pilot to regulate the engine temperatures by adjustment of the flap, with satisfactory results. The possibility of being able to control the engine temperatures on bi-motored aircraft during accidental single-engine operation is equally desirable, since slight loss in speed due to flapping the cowl is unimportant provided the engine continues to function properly.

Improvements in performance and other advantages of the controllable flaps, due to the limitations of the tests, merely indicate possible improvements and are not indicative of the limits of improvement.

The development of the pressure type baffling is also the direct outgrowth of this research.

CURTISS-WRIGHT TECHNICAL INSTITUTE

(*Continued from page* 23)

of the necessary drawings for the shop to build. He also prepares complete engineering data for submission to the Department of Commerce, and finally has an opportunity to help build the airplane as a part of his practical training.

The master mechanic student receives instruction in drafting and blueprint reading. Other related technical subjects deal with the uses of drills, metal gauges, micrometer reading, bending allowances, a general knowledge of metallurgy, use of hand tools and theory of flight.

The majority of the work in the metal fabrication and airplane construction departments is done on licensed airplanes undergoing overhaul and repair. For time spent by a student in this work, he receives credit toward a Department of Commerce airplane mechanic license. Additional training is afforded by permitting students to help construct airplanes designed by the engineering class.

In the metal fabrication department, a student learns to lay out and fabricate various forms of fittings, to weld and braze various types of metals, metal bumping, riveting, wire cable splicing and general repair on metal aircraft and parts. Methods of metal fabrication as employed in modern factories are covered by this department.

In his work in airplane construction, a student learns the layout and construction of wood ribs and spars, wing assembly, gluing methods, repair practice, covering, doping, finishing and the care and operation of wood-working machinery and hand tools.

In the engine department, experience is given in completely overhauling such engines as Wright Whirlwinds and Cyclones, Pratt & Whitney Wasps and Hornets, Kinners and other current models in general use. Instruction is given in carburetion, ignition, oil and starter systems, propellers and related subjects. Students have an opportunity to check the results of their work by testing the overhauled engines on a test stand.

Line maintenance experience is afforded a student when he maintains, inspects, refuels, services and handles the ground care of airplanes in actual daily operation.

In the weather and traffic department, a student is taught the airplane traffic control (day and night) of the Grand Central Air Terminal, and he learns to receive and transmit weather reports over the teletype system.

Thus, after several months of intensive but enjoyable work, a student is equipped to go forth into an industry that is looking for the man who knows his job.

. NEW EQUIPMENT and METHODS .

Malleablizing Electric Furnace

• A SHORT-CYCLE malleablizing furnace which reduces the total time for heat treatment to 72 hours or less, has been announced by the Westinghouse Electric and Manufacturing Co., E. Pittsburgh, Pa. Elimination of decarburized surfaces, hard skin or hard spots on the surface, picture frame structures, burned or scaled castings, is done by malleablizing based on the chemical analysis of the cast iron in an electrically heated furnace having automatically controlled atmosphere.

The heating up of the charge is done at night, during off-peak load, with only radiation losses supplied during the day: Furnaces range from ½ to 25 tons, with maximum electrical loads of 40 to 600 kw., at night, and corresponding electrical capacities of 13 kw. to 75 kw. during the day. Energy consumption for the 72-hour malleablizing cycle per gross ton of charge (castings and boxes when required) is:

25 ton furnace	375 kw-hrs. per gross ton
12 " "	450 " " " " "
7½ " "	500 " " " " "
1 " "	625 " " " " "
½ " "	775 " " " " "

Since a definite time temperature cycle is laid out, depending on the chemical analysis of the iron, every casting must be of the highest quality as to tensile strength, elongation, and machinability, for the particular analysis. Any modern plant having average melting supervision and analysis control may employ successfully this 72-hour annealing cycle. Twenty six-hour cycles have been obtained by companies having these furnaces in operation on ½-inch thick castings and where the analysis is carefully controlled.

Packing materials and heavy cast iron pots are not required. Some castings may have to be annealed in boxes, but without the use of packing material. These include castings that will not withstand much weight without danger of warpage or small castings that cannot be stacked upon the car in sufficient quantity to produce a full charge. Boxes made of ½-inch sheet steel have been used for 240 heats without signs of scaling.

Curtiss-Wright air conditioner

Air Conditioner for Sleeper Transports

• THE PROBLEM of preheating and precooling sleeper airplanes while they are on the ground at the airports is one of prime importance.

When the airplane is in the air the flying speed provides plenty of cooled fresh air through the ventilating system already built into the machine, and the heat from the motors also provides adequate warmth when necessary. On the ground, however, and with the engine stopped, these conditions do not exist, and in order to simulate them the Curtiss-Wright Airplane Co. has developed a unit which provides hot or cold air as desired.

It is a combination electric refrigerator, electric heater, and building ventilator, thermostatically controlled to keep the cabin at comfortable temperatures at all times, and adequate to change the air in the cabin completely in two minutes.

This unit fits under the belly of the airplane and distributes air through the regular ventilating and heating channels which are directly connected to each berth, and supplies better than 300 cubic feet of air per minute. It makes it practical for passengers to go to sleep while the plane is on the ground, just as they would retire in a Pullman car before the train leaves, and be assured of adequate ventilation and temperature control at all times. Also, if the plane arrives at its destination very early in the morning, it is possible for the passengers to continue sleeping in comfort for a few more hours.

Bi-Post Base for Floodlight Lamp

• THE INCANDESCENT Lamp Department of General Electric Co., Nela Park, Cleveland, Ohio, is now manufacturing the 3000-watt, 32-volt airport floodlight lamp in a T-32 bulb with bi-post base, to supersede the GT-38 with prong base.

Increased ruggedness, decreased weight and a more accurate positioning of the source with relation to reflectors or lenses are features that have been accomplished through the application of the bi-post design principle.

The lamp has a light center length of 5¾ inches and an overall length of 14 inches.

Felt Bonded Metal

• FELT BONDED Metal, offered jointly by H. H. Robertson Co., Pittsburgh, Pa., and the Felters Co., Boston, Mass., is evolved by a patented method which produces a permanent bond between felt and metal. In the process, a metal coating is fused between the layer of felt and the metal so that the fibres of the felt are embedded in the metal coating and there is an actual complete bond which will not separate under any atmospheric or operating condition. All properties of felt are retained in the process, which is not to be confused with the use of adhesive or other binder which does not form an actual bond.

The felt may be applied to one or both sides of the metal, and its thickness varied to suit requirements, as can also the weight of the sheet metal. After the felt is applied, the metal can safely be bent or shaped into any form.

There are many uses of this material and it is now undergoing tests in several research laboratories for air conditioning equipment. The felt lining not only provides sound deadening qualities but also felt-to-metal contact at all joints, thereby eliminating leakage and vibration noises.

Felt is used successfully for sound deadening, vibration absorption, heat and cold insulation, etc., and the felt bonded metal may be finished with Bakelite, lacquer or in plywood.

Maihac Torsionmeter

• FOR DETERMINING the power transmitted through propeller shafts and for testing the efficiency of machine tools and gear transmissions, the Bacharach Industrial Instrument Co., Pittsburgh, Pa., is marketing the Maihac Torsionmeter.

The instrument consists of a torsion element which is fastened on the shaft and a receiving set which can be located at any desired point away from the shaft.

Two split sleeves on the torsion element are clamped on the shaft about 15 inches apart. In each is a triangular groove with steel wire which is pressed against the entire circumference of the shaft, the distance between the circumference embraced by the wires being the test length over which the torsional deflection is measured.

Each sleeve has a projecting arm, between which is stretched, directly tangential to the shaft, a hard alloy steel cord of about 5 inches. Immediately above the cord is an electro-magnet which sets the steel cord in vibration as the current is put on and off. The vibrating cord produces in the magnetic coil an alternating current the frequency of which is the same as its vibration rate.

Since the rate of vibration of the cord depends upon the tension (which in turn is proportional to the torsional deflection of the shaft) the pitch of the tone produced by the vibrating cord is a direct measure of the amount of shaft-torque.

The current is led in and out of the torsion element by slip-rings and brushes to which are attached the leads for connections to the receiving set. In the receiving set is a comparison cord which can be stretched at will by a micrometer screw adjustment, the strain thus induced into the cord being read through a magnifying glass.

At the start of the test the two steel cords are adjusted to the same tension, thus giving tones in unison. When the shaft is twisted by the transmission of power, the flanges move relatively to one another, thus stretching the cord and raising the pitch. The comparison wire in the receiving set is then stretched by the micrometer screw adjustment and its pitch brought into unison with the cord on the shaft.

The receiving set is furnished with earphones and loudspeaker. Sound differences are distinguished in the earphones by a discordant noise which diminishes gradually as the comparison cord is brought into unison with the shaft-cord. When the two cords are nearly in unison, there is a pulsating tone which disappears as both cords are brought into unison. Then a smooth, even tone is heard.

To determine the power transmitted through the shaft, the speed of rotation of the shaft is observed at the time the torsion readings are taken. To determine the speed, an electro-magnetic revolution counter (standard equipment) is combined with a stop watch. The operation of pressing one button simultaneously starts and stops both counter and watch. For operating the counter, an additional slip-ring is on the shaft.

The effects of temperature changes and centrifugal forces upon the measuring cord are determined by a compensating cord on the torsion element. This cord is opposite to the measuring cord and is fastened only to one of the two split sleeves. Consequently, the tension and the pitch of the compensating cord is effected only by temperature and inertia effects, and not by the angular twist between the two sleeves. Subtracting the reading of the compensating cord from that of the measuring cord, gives the correct amount of torque in the shaft.

An eight-page booklet issued by the Bacharach company under the title of "Measurement of Shaft Horsepower" is available.

Improved Workace Electric Shaper

• THE NEW Workace electric shaper is a powerful, high-speed portable unit manufactured by J. D. Wallace & Co., Chicago, Ill., for short or small runs of moulding, beading, grooving, shaping, and tenoning.

Recent improvements include a large horizontal handwheel adjustment which enables easy raising or lowering of the table in a range of 1½ in., and without changing its position in relation to the operator. The fence for straight shaping also has been improved, being held in position by two bolts permitting adjustment in the slotted holes with further adjustment provided at the infeed end. This adjustment is made so that the stock will rest against the front and rear of the fence before and after the stock has been removed from the cutting. The movable section of the fence is mounted in machined ways which allows simple and accurate adjustment, and when the fence is set at the desired depth it may be locked in position if desired.

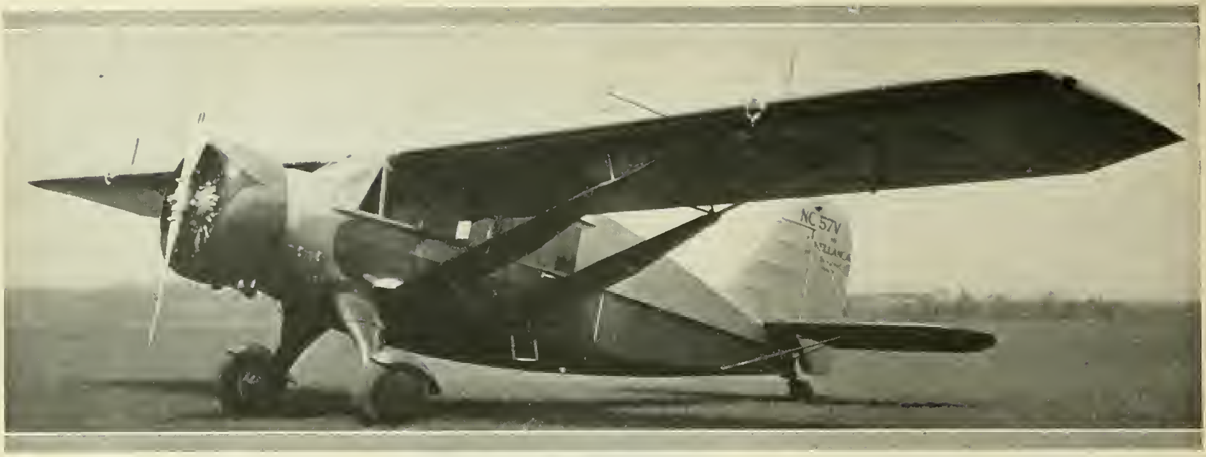
A standard toggle switch with a protecting cast-iron covering guards against accidental closing of the circuit. The unit is driven by a ventilated motor in the base which maintains a speed of 10,000 r.p.m. under no-load condition.

Quality

QUALITY, in an airplane, means more than seating comfort and glossy finish. It also means more than spectacular demonstrations and written claims. ¶ True quality, as we interpret it, means the very best of materials, the finest precision workmanship and the many extra things we do to give the purchaser of a new 3-place Fairchild Cabin a ship that will definitely have a *longer life* than is expected of most other ships. ¶ True quality, as we have built into this new Cabin plane, means fifty-two sets of grease-sealed, self-aligning ball-bearings on the control systems. It means sand-blasting the chrome-molybdenum fuselage before coating it with aluminumized oxide. It means 1½" spars with metal compression struts and ¼" drag wires. It means replaceable bronze bushings on all movable landing gear parts. It means cadmium-plated fittings, bolts and wires . . . baked enamelling of all internal wing struts and brackets . . . anodizing and heat-treating of aluminum and dural parts. It means a shatter-proof windshield, ample inspection ports, moisture drains in airfoil sections, specially tested lift struts, full streamlining, NACA Cowl, wheel pants and a 100% reserve in landing gear strength. Add to this structure the quality performance resulting from ten years of pioneering experience in the building of cabin ships and you have the answer to the instant popularity of this new Fairchild Cabin. ¶ As a result of this quality, the owner of a new Fairchild Cabin obtains a heavy duty airplane with the flashy performance of a racer. He obtains a ship that carries three people higher, farther and more economically than any other standard cabin ship of similar capacity. And best of all, he obtains the peace of mind which can come only from complete confidence in every part of the plane . . . confidence created by the quality of the *inside* as well as the outside structure. ¶ Anyone wishing to get more information about this new Fairchild—the plane that is at the head of our line to date—can get it by writing for literature and prices.

FAIRCHILD AIRPLANE SALES CORP.
Woodside Long Island New York

Advertisement



The 1934 Bellanca Senior Skyrocket

● The 6-place Senior Skyrocket produced by Bellanca Aircraft Corp., New Castle, Del., is offered in the "Standard" and the "DeLuxe" models, both of which are powered by the Pratt & Whitney S1D1 525-horsepower engine. The standard model has the usual fine workmanship, appointments and equipment associated with Bellanca commercial planes, while the Senior Skyrocket DeLuxe is custom-equipped with specially arranged cabin interior, additional instruments, and more latitude in the choice of colors and upholstering materials.

The wing area is substantially supplemented by the type of external bracing used, the struts forming lifting surfaces at high angles of attack. These fabric-covered struts have steel spars with forged ends, and dural ribs attached by means of clips. Thus, in addition to their action in improving the lift at times when most needed, they are effective in bracing the wing and fuselage units into a solid structure, preventing unusual loads from being transmitted unduly to any individual component.

Wings are of two-spar wood construction covered with grade A fabric. Solid spruce spars are used and routed wherever practical to reduce weight. Ribs are of spruce and plywood, glued under pressure in a large screw-press, while rib interbracing is of the triangular truss type. From wing tank bay to wing tip, midway of the wing chord, each rib is fastened both top and bottom to light spruce stringers.

Where lift strut fittings are placed, wing spars are reinforced by solid birch blocks. Ends of spars to which wing hinge fittings are affixed are also strengthened by birch plywood on each side. The light spruce stringers further stiffen the ribs and hold them vertical beneath the fabric.

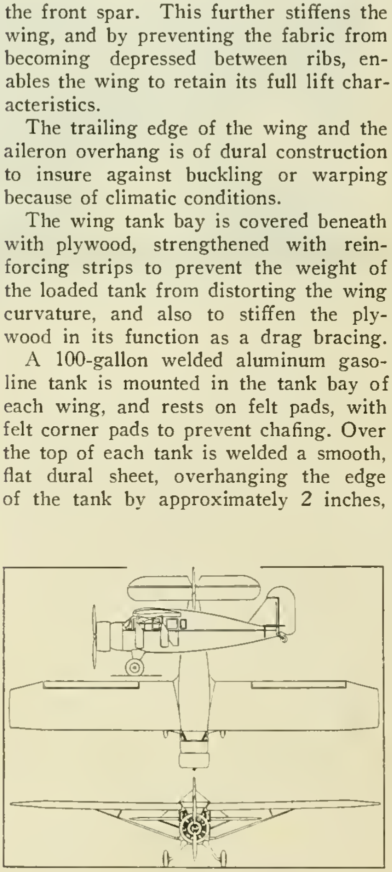
Compression members are of routed spruce. Two sets of tie-rods are used for each of the three bays, spaced as far apart vertically as possible, in order to give good torsional rigidity to the wing.

The leading edge of the wing is plywood covered, extending as far back as the front spar. This further stiffens the wing, and by preventing the fabric from becoming depressed between ribs, enables the wing to retain its full lift characteristics.

The trailing edge of the wing and the aileron overhang is of dural construction to insure against buckling or warping because of climatic conditions.

The wing tank bay is covered beneath with plywood, strengthened with reinforcing strips to prevent the weight of the loaded tank from distorting the wing curvature, and also to stiffen the plywood in its function as a drag bracing.

A 100-gallon welded aluminum gasoline tank is mounted in the tank bay of each wing, and rests on felt pads, with felt corner pads to prevent chafing. Over the top of each tank is welded a smooth, flat dural sheet, overhanging the edge of the tank by approximately 2 inches, through which the tank is secured by closely spaced screws and bolts.



Bellanca Senior Skyrocket outlines

The wing unit is rigid with no flutter at any speed. Ailerons, of the slot-balanced type and effective even after the stalling point is reached, are operated by cables running over ball-bearing Micarta pulleys.

The fins and rudder are of chrome welded molybdenum steel tubing with fabric covering. The stabilizer and elevators are of spruce structure with dural trailing edge on the latter.

Due to the method of protecting the cabin on all sides by members of double tubular construction and gussetted cross-frames, the cabin resists deformation or warping under extreme twisting and bending stresses.

Below the window sills on each side are supplementary longitudinal members built of two steel tubes, joined by a strip of chrome molybdenum sheet steel, welded to both tubes throughout their entire length so as to form one member. Main vertical members on each side of the cabin are built in the same manner, as is the main top cross members.

The landing gear is of the low-drag, cantilever type, having a tread of 96 inches. Semi-air tires 9.50 by 12 are used. Wind tunnel tests of this landing gear indicate a 67 per cent reduction in drag for this unit in comparison with the previous type. This increase in efficiency is largely created by the fact that there is but a single streamlined landing gear leg exposed on either side of the fuselage, as compared with three members exposed on each side on the previous type. Oleo shock absorbing struts are mounted inside the fuselage in crosswise opposed fashion, so that when viewing the landing gear mechanism from the front the moving parts actuate with a scissors motion. This system eliminates the necessity for heat-treated landing gear members in the fuselage, the former heat-treated round landing gear cross-tube being replaced by a welded bridge-type framework. Repair and replacement of landing gear structural members are greatly facilitated. All joints and bearings have Alemite-Zerk lubrication.

The Senior Skyrockets are equipped with the Pratt & Whitney S1D1 Wasp rated 525 horsepower at 7,000 feet. An Eclipse direct drive electric starter and hand crank are provided. The installation is easily accessible by the automobile-type lift-up cowling, and a full NACA type ring cowl is fitted. The rear of the engine can be reached without difficulty for inspection or adjustment.

The oil tank under the engine cowl has a capacity of 14 gallons, with an effective oil cooling system provided, wherein the oil is cooled upon coming from the engine by means of passing through a small honeycomb radiator. An adjustable scoop in the air stream shunts the air from the propeller blast through this radiator, thus insuring proper oil temperatures for maximum engine efficiency and service. The air scoop is adjustable from the pilot's cockpit.

The interior of the cabin is roomy and free from obstructing members without sacrifice of strength. The cabin is 124 inches long and has a maximum width and height of 45.5 inches by 57.5 inches. The baggage compartment located behind the rear seat, and accessible from inside and outside, has a capacity of 15 cubic feet.

Appointments in the cabin are comparable to those of custom-built motor cars, such items as individually-operated ventilators, adjustable rear windows, cabin heater, etc., insuring comfortable flying under extremes of temperature.

Cabin chairs are of welded steel tubing, attractively upholstered while cushions are of sponge-rubber. The rear seat is provided with arm rests and drop center arm.

The System of Ventilation

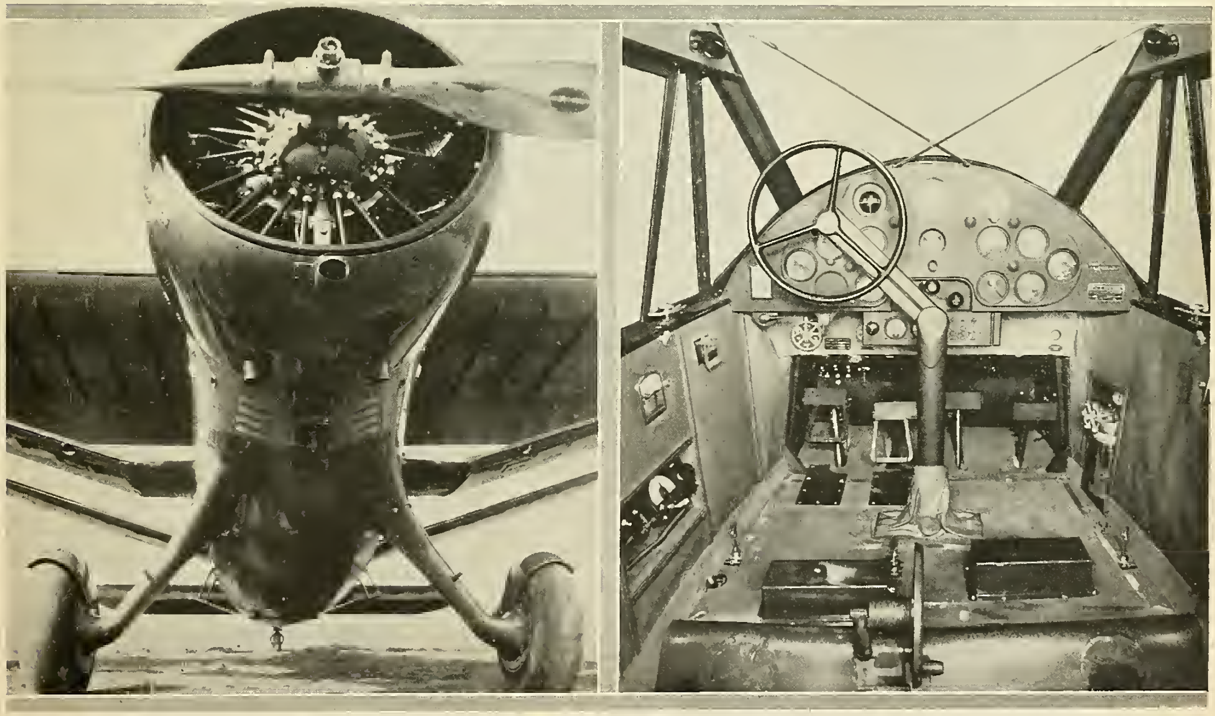
All windows are of non-shatterable glass and a new system of ventilation, as well as soundproofing has been provided. The ventilation system is effective in all kinds of weather. Air is led through a duct beneath the floor of the ship to the rear of the cabin where it comes into the cabin through a ventilator opening with adjustable shutter. At points along the floor, individual ventilation or heating outlets are provided. In warm weather, fresh pure air under pressure is fed into the opening of the ventilation duct which has its outside opening in the lower part of the lift strut stub. In cold weather this passage is closed, while a heater unit enveloping a portion of the exhaust pipe is connected with the ventilation duct, thus supplying fresh warm air to the cabin. By opening the pilot's triangular cockpit window outward, greater draft is inducted to the rear cabin, and either draws in more cool air in warm weather, or more warm air in cold weather. No direct or semi-direct propeller blast reaches the cabin through open windows, which has the effect of diminishing cabin noises.

Ease of maneuvering on the ground is aided by the shock absorbing 360° tail wheel unit, with 4 by 5-inch balloon tire. The operation of the shock absorbing unit is entirely mechanical, hence no trouble is experienced from fluids or valves, etc. The rudder of large area in conjunction with the individually-operated brakes permits good control while taxying.

The throw-over wheel control column is the type used on the Airbus and Aircruiser models for the past three years. Rudder control is through dural-pedal control system with large rubber-padded pedals.

Brake control is provided through the left-hand set of pedals, on which heel-brake units are provided. The pilot's seat is adjustable fore and aft, insuring relaxation and consequent flying ease at all times.

Fabrics and other materials (leather, fabrikoid, flexwood, formica, plywood) used in cabin finishing, are tailored and fitted to the dictates of fine custom coachwork. Leather or fabric safety belts,



View of the new cantilever landing gear of the Bellanca Senior Skyrocket and cockpit interior with pilots' seats removed matching the interior color schemes, are provided for pilot and passengers.

Front cockpit side windows are hinged at the top for emergency opening, being held in place at the bottom by ball-type knock-out fasteners.

Equipment of the Senior Skyrocket Standard includes a 12-volt, 35-ampere hour battery, indirectly-lighted instrument panel on rubber suspension, tools, first aid kit, engine cover, fire extinguishers, tachometer, oil pressure gauge, altimeter, magnetic compass, air speed indicator, rate-of-climb indicator, bank and turn indicator, clock and gasoline gauges. Equipment of the Senior Skyrocket DeLuxe includes all the above, plus generator, landing lights and flares, radio bonding and shielding, large folding couch-chair at customer's option, artificial horizon and directional gyro.

In applying the exterior finish to the plane, the fabric is hand-rubbed after applying the clear coats of dope, and again rubbed by hand to a high luster finish after application of the pigmented dope coats. Metal parts are given sprayed coats of lacquer to match.

The weight empty of the Standard model is 150 pounds less than the DeLuxe, and carries 185 gallons (1,110 pounds) instead of 160 gallons (960 pounds) of gasoline. Dimensions and performances of both the Standard and De Luxe models are similar.

Permanent fittings are provided for attaching a float undercarriage should it be desired to convert the ship to a seaplane.

Specifications (DeLuxe Model)

Wing span	50 feet 6 inches
Overall length	27 feet 11 inches
Overall height	8 feet 6 inches
Wing area	311 square feet
Horsepower, P. & W. Wasp	525 h.p.

Weights (Pounds)

Weight empty	3,300
Pilot's weight	170
Weight of 5 passengers	850
Weight of baggage	215
Weight of gasoline	960
Weight of oil	105
Useful load	2,300
Gross weight	5,600

Performance

High speed at 7,000 feet	185 m.p.h.
Cruising speed at 66% power	159 m.p.h.
Climb	1,240 feet per minute
Service ceiling	25,000 feet
Range	910 to 1,280 miles

LETTER TO A GENERAL

(*Continued from page* 19)

are helpless, and that you have to call on us civilians to get you out of the hole that your military minds got you into.

You will recall that if the war of 1914-1918 proved anything conclusively, it proved that soon after the war started the generals on both sides got themselves and their armies into a hopeless, bloody mess; and there they stuck until the civilian intelligence of their respective countries came to their rescue and dug them out.

Now, I'll admit that these old commanding officers knew all about military tactics; they had studied the uncertain and wavering "science" of warfare, from Hannibal to Napoleon; they knew all about strategic moves here and there—allowing that both armies kept moving. *But the armies didn't keep moving.* They became locked opposite each other, in trenches, dug-outs and forts. Neither side could budge, except at the cost of appalling losses. There they stuck, on either side of the Hindenburg line, hammering away at each other, losing men by the thousands and tens of thousands, in feeble push after feeble push—and neither side coming any nearer to winning the war by military maneuvers.

"War of Attrition"

Of course, you generals coined a phrase to excuse your stupidity. You declared that this was a "war of attrition." In a war of "attrition" the side that wears down and starves first loses. It will mean war against the nurseries; and the most successful General will be the one who can starve the greatest number of babies! To this sorry state did the profession of arms actually fall in the last world war! It was German civilian chemists who advocated the use of gas (which is about the most humane form of warfare yet invented.) And it was English engineers who designed the tanks and taught the dumb English Generals how to use them. Of course, neither weapon was used efficiently, because the old Generals couldn't quite get the idea until these weapons had been in use for months, by which time, of course, the surprise element was lost.

You and I know that Generals, as a bunch have learned hardly anything since the American Civil War. You take that funny Cavalry outfit of yours, for instance; it's adequately equipped to fight in any war up to about 1896, and if we could just turn the calendar back, it would be an efficient force. But it's absolutely no good for a war we might have to fight in 1934. I saw a news reel of it recently. They loaded a squadron of men and horses into motor trucks, carried them to the scene of operations; and then men and horses unloaded, formed up, and came charging at the camera, simulating the way they would charge an enemy. If there had been a machine gun instead of a camera, they'd all have been shot.

What do you suppose is going to happen to Cavalry like that in the next war? In this motorized age about the only people who are using horses are the Cavalry and Borden's Milk Company, who prefer a horse because it will follow the driver from door to door. You put out an order last April abolishing the cavalry sabre. Why not abolish the horse, too?

And how about your Infantry? Do you actually believe that your men, equipped for a war in 1898, are going to be able to fight and survive in a modern war? Last April, in the war between Bolivia and Paraguay, there was fought the Battle of 100 Hours at Las Conchitas. Did you learn anything from that battle? The Bolivians were entrenched in open hayfields, and artillery bombarded the trenches for two days. Then—I quote from *Time:* "The first wave of Paraguayans stumbled out into the hayfields in a close formation bayonet charge. The Bolivians had their first fun in months. With machine guns they mowed down the lines of little brown men, left not one standing. Another wave came over, and another. Here and there an officer and a few men gained the Bolivian trenches, leaped down and died fighting. That night the Paraguayans came over again, four times, but the darkness was not cover enough from the machine guns. Slow learners, they kept it up next day, trotting in solid lines across the plain, across the bodies of their day-old dead. On the fourth day as dusk drew in, the Paraguayan officers led their men in two last desperate charges, as futile as all others. . . . The dead, 3,000."

Your American infantryman to-day faces annihilation if you ever attempt to use him in moving warfare.

No Offense Intended

Of course, after you generals have lost tens of thousands of our boys, the civilians will come to your rescue, as usual. Civilian engineers will design and build modern mobile armor-steel thick enough to deflect bullets, mounted on caterpillar treads, and pulled along by a small motor.

Now, General, don't take offense at anything I've said in this letter; there's nothing personal about it. As man to man, as one American to another, we should be able to discuss the defense of our country without becoming annoyed. I honestly feel that our military leaders have been asleep on the job, and I'm telling you of it so that you won't be surprised in our next war.

Yours very sincerely,

Cy Caldwell

Brewer Horizontal or Vertical Engine

● The problem of producing an aircraft engine so that it would conform to the requirements of a well-known aircraft designer, was undertaken by Capt. R. W. A. Brewer, of Huntingdon Valley, Pa. Before proceeding with his designs, Capt. Brewer was given specifications and conditions which had to be met, including: construction which would permit a plane to be built with the engine (or engines) so mounted that maximum visibility was obtainable; the possibility of mounting the engines in either a vertical or horizontal position; a self-contained unit in which all accessories, oil tanks, etc., are readily demountable as complete units, and a quantity-production construction which allowed, as far as is practical, interchangeability of parts.

The opposed eight-cylinder type was finally decided upon, with full appreciation of the fact that such a design presented difficult problems, chief of which were mechanical balance and distribution so as to also give pressure balance.

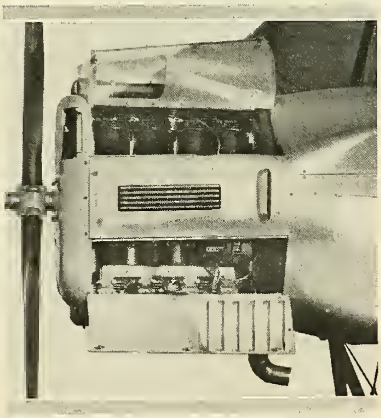
Two alternative plans were designed, submitted and approved but preference was given to one. This one was adopted, and the work proceeded after the crankshaft design was tested for critical vibrations. A favorable report was returned, stating that the lower critical was above anything that might be reached in service.

Four experimental engines, each of 511 cubic inch displacement, two to be mounted vertically and two horizontally, were then put into manufacture. Cylinders and heads are all similar and are so mounted on the crankcase that nuts can be operated by speed wrenches. Each unit part is self-contained; for example, the overhead valve gear can be taken down without disturbing any other parts. Two complete sets of oil scavenge and pressure pumps are mounted in the line of the vertical drive, and, because of the telescopic arrangement of the operating and shrouding mechanism, each set can be removed without disturbing the valve gear. Additional scavenge oil pumps are mounted at will at the ends of the camshafts and serve to evacuate the gear housings.

The specially designed, high-speed valve gear runs in oil, the cams actuating the valves through stirrups (or plunger cups) of very light construction, so as to reduce the inertia of the parts and eliminate side thrust on the valve stems.

These engines were designed to operate at 2000 r.p.m and the power curve drops after 2200 because the valve ports are somewhat restricted by the attempt to keep the overall length across the cylinder blocks as low as possible. Tests showed the power of the horizontal engine to be greater than anticipated, that it gave good acceleration and was steady at all speeds. Temperature readings taken on all the cylinders showed good power distribution with temperatures varying only slightly. Cylinder head temperatures at the rear were 240°C; at No. 2 cylinder, 220°C and barrel temperature (mean) 110°C, at an air speed of 130 m.p.h. The average temperature of carburetor air intake was 23°C and the average temperature of oil in the sump 63°C.

Tests were made with one, two, and three carburetors. The slight improvement gained was mainly due to a small reduction in the manifold pressure with additional carburetors in use. The design provides six positions for mounting any type of carburetor, vertical updraft, downdraft or horizontal. Although the latter type was preferred, it was not obtainable at the time of the tests.



Flight tests were conducted in a plane which had a special firewall and cowl for the purpose. The engine is mounted directly upon the firewall, six mushroom shaped feet being provided at the rear of the crankcase with rubber washers placed between the feet and the firewall. The complete engine is symmetrical about the center line of the crankshaft, and any tendency for torsional oscillation is absorbed in the mass of the engine. The center of gravity is about an inch ahead of that in a radial engine of similar size.

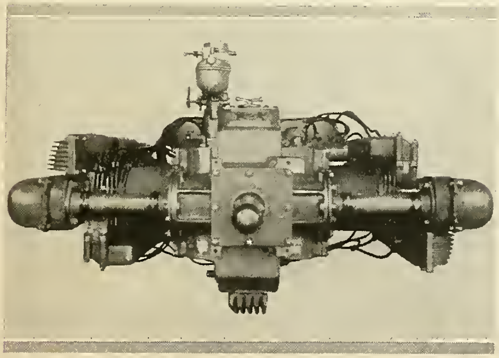
The new-type cantilever mount was tested in the early development stages and found rigid and desirable.

A notable feature is the method of oil circulation whereby a portion of the oil circulates during the warming-up period so that only a few minutes is taken for temperature equilibrium.

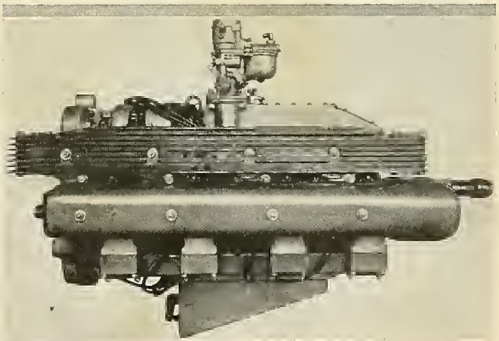
In the design of the craft, the firewall is narrowed at the top and extends to a width of 10 inches at the front of the cowling, with the sides swept down to the level of the center line of the crankshaft. As the pilot in the plane designed for use with this engine sits directly behind the firewall, and there are no obstructions in front of him, his line of vision is increased, and he can see the ground about 30 feet ahead when landing.

The principal dimensions of the Gryphon Model M engine are as follows:

Bore	4.375 inches
Stroke	4.25 inches
Piston displacement	511.1 cubic inches
Weight with oil tanks	420 lbs.
Width across cylinders	39 inches
Length overall	36 inches
Horsepower at 2200 r.p.m.	155 b.h.p.
Fuel consumption (max.)	0.5 lb./b.h.p./hr.
Average oil consumption	7.2 lbs. per hr.
Compression ratio	5.3 to 1



Vertical installation (above) and two views of the horizontally arranged eight-cylinder Gryphon Model M aircraft engine



Personalities

By Caldwell

● HARRY D. COPLAND, America's gift to the aviating Chinese of Boston, was born in Cambridge, Mass., April 17, 1896, and was educated at Rindge Technical School, Cambridge. At a tender age gliders and antediluvian aeroplanes began to get in his way, turning his youthful attention to the building of model airplanes and gliders. With Norman Prince he flew a glider by the hop, skip, and jump method at Franklin Field, Boston, in 1909, when he was only thirteen years old. During the summer of 1911, at Detroit, he helped Herbert Buchbinder complete a home-made Curtiss-type pusher powered with a loaned Maximotor. In this awe-inspiring creation he went through a period of grass-cutting and eventually made short flights from Ferrie's Meadow—from one end of it to the other. One evening he inadvertently flew out of the meadow, across a road, and landed in an adjoining field. Detroit papers referred to this, in headlines, as "Copland's cross-country flight," and called Harry the world's youngest aviator. His rival for this honor was another youngster, three months older, whose name was and still is Guy Gilpatric; you have probably read his amusing sea stories in the *Satevepost.*

In 1912 Harry Copland formed the South Bend, Ind., Aero Club, which built and flew five gliders. And that same summer he took a flying course on a Model B Wright from Max Lillie at Cicero Field, Chicago. In 1914 he obtained a commercial radio operator's license, and between school terms sailed the seas for Mr. Marconi. He went in for radio operating in earnest during 1915 and 1916, when he served as operator on British ships running the German submarine blockade. He served on the *Cambrian*, the *Canadian*, and the *Sagamore,* stepping off that unfortunate vessel when a German torpedo sent her plunging to the bottom of the Atlantic somewhere off the coast of Ireland. Landed in England, he attempted to join the Royal Flying Corps, but couldn't lie well enough to convince them that he was a British subject—though with a Boston accent he didn't sound like the average American. The English probably suspected that he was a German spy who had attended Harvard. After a visit to France he returned to the United States, offering the Navy his services. But he was under weight, so the Navy turned him down, and he went to Toronto and joined the R. F. C. as a cadet. By 1917 all the heavy Canadians had been used up, and they were willing to take light Americans.

Harry Copland in his 1911 pusher

In this connection I might mention my own efforts to join the R. F. C. in the spring of 1915. I was instantly turned down because I didn't have a college education; in fact, I didn't have hardly *any* education. I sarcastically inquired by letter if they wanted me to lecture Germans, or shoot them? They never even answered. But when I applied again, in the summer of 1916, they instantly gave me a medical examination and a ticket for England. They never asked me if I knew anything. Evidently enough college graduates had been rubbed out to leave plenty of room for lads who drank their tea out of the saucer, after blowing on it to cool it, and ate potatoes with a knife. None of us ever got anywhere socially in England—the Oxford polish was lamentably missing, and we were considered quaint. But they didn't mind us doing a bit of fighting for them.

Harry Copland went through the regular course, spending only one day at Rathburn, the primary flying school, as he had soloed before. He was commissioned a 2nd Lieut. and made instructor of flying at Camp Borden, Ontario, then shipped to Hicks Field, Fort Worth, Texas, where he instructed in aerobatics. In April, 1918, he was sent to Beamsville, Ontario, in charge of instructional flight, was promoted to the lordly estate of 1st Lieut. and sent overseas. From Felixtowe, England, he flew boats on North Sea patrol until the armistice, when he went with the Army of Occupation, flying in 203 Communication Squadron until it was demobilized in August, 1919. He had shot nobody and nobody had taken a shot at him: it turned out to be a very peaceful and interesting war.

After leaving the Army he became Chief Pilot, Universal Aviation Co., Detroit, and barnstormed and instructed over the U. S. and parts of Mexico and Canada until 1923. During 1923 and '24 he was President of Atlantic Airways, Inc., at Hingham, Mass., using flying boats. There is something about a flying boat that definitely slows down an old airplane pilot. I've noticed it time and again in the biographies of pilots that I have been presenting to my six readers. Once an airplane pilot gets along to flying boats, there's one thing he always does: he gets married and carelessly starts raising a family. The same confounded thing happened to me after the war, and I never got completely over it. At High River, Alberta, I was flying forest patrol in DH 4's over the Crow's Nest Pass Forest District, a happy, carefree bachelor, working for the Canadian Government, which thoughtlessly transferred me to Victoria Beach, in Northern Manitoba, and told me to go fly a boat. Well, I flew the boats, HS 2L's and F3's. And what was the result? I got married; and to this day I maintain it was the boat that did it. Perhaps I started to look like a sailor, and all sailors are easy prey for any prowling woman. Anyhow, I got captured—me, a free spirit, obviously cut out to be an ideal bachelor.

Well, this poor old Copland had the same thing happen to him. No sooner did he get to flying boats in peace time than a young woman snapped him off and married him, back in 1925. She's still hanging onto him, too. They have two children, live in Hingham (he never even got out of town in nine years) and Harry puts in his spare time planting and hoeing large flower and vegetable gardens, just as I do today. It's very poor sport, I may inform any young and still free pilot, and I do not recommend it to anyone under fifty. Let this be a lesson to you boys: lay off boats—they're a menace!

In 1925 Harry Copland formed the Copland-Brinton Air Service at Hartford, Conn., and in Dec., 1926, made the first commercial advertising flight from Maine to Florida with an Aeromarine 39-B. He formed the Interstate Airways, Inc., Hartford, in 1927 and sold out in 1929 to join Curtiss Flying Service as Hartford manager. He then assisted Bill Winston in the Instructor's School at Grosse Isle, organized and managed the first Curtiss Summer Flying Camp at Marthas Vineyard, Mass.; managed the Curtiss base at Boston, and in 1931 became Eastern District Manager in charge of sales and operations from Maine to Florida, until July, 1932, by which time there wasn't much left to manage.

Since then he has been operations manager of the New England Giro Company, lecturing on aviation, writing articles, flying with the Army Reserve, and directing the activities of the Chinese Aviation School in Boston. Here are being trained young Chinese pilots who intend to return to China to see what, if anything, can be done for poor old China, out of which European powers have been nibbling bits for years, and out of which Japan recently chewed off a large chunk called Manchuria. The Chinese are a very peaceful, inoffensive people, and slow to wrath; but all of this gradual surgery on China has got under their skins, and they are becoming annoyed. Of course, they can marry the daughters of these invaders, who in two generations undoubtedly will lose their original national identity and become Chinese. But that is a slow process, and a lot of Chinamen object to marrying Japs anyhow, even for patriotic reasons. As a course entailing less suffering and less wear and tear on the system, the Chinese are advocating building up an Air Force; and these Chinese in Boston, a dozen or so of them, are learning to fly. Last year each member piled up about 40 hours solo, so they're not doing bad at all. They are full of pep and pay close attention to lectures and instruction, but naturally their unfamiliarity with Copland's Boston accent is somewhat of a handicap. But they are trying hard. As for Harry, after all his experiences, even teaching Chinamen is a comparatively simple matter.

He is now about to leave the country for a vacation, taking a Condor down to Colombia, flying the ship from St. Louis on wheels and transferring to floats at New York. After nine years in Hingham, Mass., it's about time he went somewhere.

* * *

● WHEN THE Roll of Fame and Aviation's Martyrs is compiled, the name of Earl M. Harvey should have a place well at the top. In the Cause of Aviation, he ate, he listened, he spoke, he suffered, but he survived. To Aviation he gave, not his life, but his patience and his digestion. Exhausted, worn, and a mere shadow of his former self, he now passes his declining years in the city of Chicago, in the brokerage business. But during his active life, on an aviation tour, he made 162 after-dinner speeches and 42 radio addresses. Imagine the stamina of a man who has faced roast chicken at 162 banquets! These banquet chickens are made of pure India rubber, placed in an oven to make them even tougher, and then varnished, sawed or blasted into portions, and covered with shellac. I have wrestled with dozens of them myself, so I can appreciate the endurance of a man who has tackled 162 of them, and lived through it.

E. M. Harvey

Earl took up aviation as a hobby, back in 1927, helping a friend organize an aviation school, and becoming Sales Instructor. Never having sold an airplane himself, he gave learned lectures on how to sell airplanes. His lectures were remarkable for their enthusiasm, which might not have been the case if he had actually tried his hand at it himself. By the time of the Detroit Aircraft Show in 1929 he had accumulated 230 hours as a passenger in various types of aircraft, flying all over the United States. He became a free ride bug.

In 1928 he joined General Tire & Rubber Company in charge of aeronautical sales, and by 1929 he had become demented enough to suggest to his company a tour of the United States of a flock of airplanes flown by Army pilots in military formation—a group of recent graduates from Kelly Field. The company had known Earl long enough to get just as wild as he was, so Earl was cheerfully given the job of organizing the tour, selecting the personnel, and generally supervising the circus. The late P. T. Barnum would have been glad to know Earl, and might even have got a few tips from him. It was with this circus that Earl gnawed the rubber banquet chickens and made the speeches which practically wore him and the audiences down to the vanishing point. In fact, time after time, entire audiences vanished completely before he was through speaking, leaving him staring in some confusion at the janitor, who came in to clean up. I've had the same experience myself, and found it most disconcerting.

Earl used to address Rotarians and Exchange Club members, with an occasional gathering of Lions or Elks thrown in to round out the suffering. There is nothing more stolid and unresponsive than a large Elk, full of chicken and apple pie. But the General Tire Sky Fleet did a lot of missionary work for aviation back in 1929, taking people for rides and getting them to fly. The tour covered 31 states, gave Earl 214 more hours of passenger flying, and led to his taking a little flying instruction and finally going solo himself. He's been flying ever since.

In 1930 an agricultural urge came over him, and he went to the Pacific coast and sowed rice by airplane. Not being a chicken or a Chinaman, he never ate any of the rice, but in the summer of 1931 he incautiously put himself in the path of Ed Porterfield, who sold him an American Eaglet and made him Eastern Sales manager of the company. Earl flew the Eaglet all over the eastern states, trying out his lecture courses on airplane selling, but without success. He finally caught a bird asleep in New England, sold him the Eaglet before the lad was completely awake, and then dashed off to Erie, Pa., where he became aviation editor for the Erie Daily Times, organized the Erie Air Pilots' Club of 62 members, and then went to Cleveland where he did a fine job as publicity director of the 1932 air races.

Realizing that beer was coming back, Earl connected with the National Steel Barrel Co. of Cleveland as their Western District representative, and went to Chicago in the fall of 1932. He travels all around that part of the country, selling barrels in Kansas City, Omaha, the Twin Cities, and St. Louis, usually trav-

(*Continued on page* 74)

. AIRLINES and AIR TRAVEL .

Operators Resume Mail Flights

UNITED AIR LINES, Inc., reorganized and repersonnelized to meet Government wishes, picked up where it left off on February 19, and began flying air mail on May 8 over three of its newly-awarded routes. A fourth route was flown by General Air Lines, formerly Western Air Express. They were the first of the private operators to resume service under temporary three-month contracts awarded after competitive bidding.

Postmaster General James A. Farley awarded air mail contracts on 19 routes previously advertised and announced the receipt of bids on 10 more new routes and 2 upon which bids had been rejected. When all contracts are let, including the new ones, the total route mileage of the air mail system will be approximately 28,548 miles, an increase of about 3,088 miles over the old system which totaled 25,248 miles. Four additional states and 21 cities which heretofore had no air mail service will get it under the new set-up. However, due to fewer schedules, the daily mileage will be decreased. Under the old system 97,076 miles were scheduled to be flown each day; under the new system this figure has dropped to 78,198 miles, or 18,878 miles less per day.

Many new operators were given air mail contracts, while in some cases the older operators found themselves with considerably less mileage than before. This was particularly true of American Airlines, the former American Airways, which ceased operating on six routes after it had unsuccessfully bid on them. Eastern Air Lines (previously Eastern Air Transport) profited in its mileage by the new awards, flying over considerably more territory than it had before. In almost every other case, the older operators were flying over the routes they maintained before the February cancellation order.

A summary of the awards for the 19 routes, indicating the contractor, route, approximate mileage, equipment and executive personnel follows:

United Air Lines, Inc.
Chicago, Illinois

Routes: (a) Newark-Oakland, via Cleveland, Toledo, Chicago, Moline, Iowa City, Des Moines, Omaha, Grand Island, North Platte, Cheyenne, Rock Springs, Salt Lake City, Elko, Sacramento and San Francisco; 2720 miles. Rate, 38 cents per mile.

(b) Seattle-San Diego, via Tacoma, Portland, Medford, Sacramento, Oakland, San Francisco, Fresno, Bakersfield and Los Angeles; 1224 miles. Rate, 39.5 cents per mile.

(c) Salt Lake City-Seattle, via Boise, Pendleton, Pasco, Spokane, Portland and Tacoma; 1029 miles. Rate, 39.5 cents per mile.

Equipment: Routes (a) and (b): 33 Boeing 247. Reserve: 9 Boeing 80A-4, 2 Boeing 80, 2 Ford 5-ATD, 6 Boeing 40B4, 2 Boeing Monomail, 6 Boeing 95. Route (c): 4 Boeing 247, 3 Boeing 40B4.

Officers: President, W. A. Patterson; vice-president, C. B. Colyer; secretary, J. F. McCarthy; treasurer, C. E. Brink. Directors: Same and P. M. Godehn, F. W. Jackson and C. C. Thompson.

Eastern Air Lines, Inc.
New York, N. Y.

Routes: (d) Newark-Miami, via Philadelphia, Baltimore, Washington, Richmond, Raleigh, Florence, Charleston, Savannah, Jacksonville and Daytona Beach; 1195 miles. Rate, 29 cents per mile.

(e) Newark-New Orleans, via Philadelphia, Baltimore, Washington, Richmond, Greensboro, Charlotte, Spartanburg, Atlanta, Birmingham, Montgomery and Mobile; 1305 miles. Rate, 19 cents per mile.

(f) Chicago-Jacksonville, via Indianapolis, Louisville, Nashville, Chattanooga, Atlanta and Macon; 928 miles. Rate, 19 cents per mile.

Equipment: Route (d): 2 Curtiss-Wright Condor T32, 2 Pitcairn Mailwing PA8. Reserve: 2 Curtiss-Wright Condor T32, 2 Pitcairn Mailwing PA8, 2 Pitcairn Mailwing PA7. Route (e): 2 Curtiss Condor CO, 2 Curtiss-Wright Condor T32, 2 Stinson SM6000B, 2 Curtiss-Wright Kingbird D2. Reserve: 2 Curtiss Condor CO, 2 Curtiss-Wright Condor T32, 2 Stinson SM6000, 3 Curtiss-Wright Kingbird C2. Route (f): 2 Pitcairn Mailwing PA7, 2 Stinson SM6000B, 2 Curtiss-Wright Kingbird D2. Reserve: 4 Pitcairn Mailwing PA7, 2 Stinson SM6000, 2 Curtiss-Wright Kingbird D2.

Officers: President, E. R. Breech; vice-presidents, L. E. Gill and G. A. Cushing; secretary, L. R. Beardslee; treasurer, J. J. Mehl. Directors E. R. Breech, H. M. Hogan, L. R. Beardslee.

American Airlines, Inc.
Chicago, Illinois

Routes: (g) Boston-Newark, via Hartford; 201 miles. Rate, 33.33 cents per mile.

(h) Fort Worth-Los Angeles, via Abilene, Big Spring, El Paso, Douglas, Tucson and Phoenix; 1329 miles. Rate, 39.5 cents per mile.

(i) Newark-Chicago, via Buffalo, Detroit, Ann Arbor, Jackson, Battle Creek, Kalamazoo and South Bend; 794 miles. Rate, 39.5 cents per mile.

Equipment: Route (g): 1 Curtiss-Wright Condor T32, 1 Stinson U. Reserve: 1 Curtiss-Wright Condor T32, 3 Stinson U, 1 Ford 5-ATB. Route (h): 4 Curtiss-Wright Condor T32, 4 Lockheed D. Reserve: 3 Curtiss-Wright Condor T32, 1 Lockheed 9D, 4 Ford 5-ATD, 1 Vultee V-1. Route (i): 5 Curtiss-Wright Condor T32, 2 Ford 5-ATD, 1 Stearman.

Officers: Chairman of board, L. B. Manning; president, L. D. Seymour; vice-president, C. R. Smith; secretary, H. Kondolf; treasurer, T. J. Dunnion. Directors: L. B. Manning, L. D. Seymour, C. R. Smith, T. J. Dunnion, R. S. Pruitt.

(Continued on following page)

TWA's Cyclone-powered Northrop Gamma which set new coast-to-coast record

Congratulations
AMERICAN AIRLINES!

American Airlines have sponsored the first, luxurious "Sleeper Plane"—now flying on regular schedule. Unprecedented comfort—security—speed—safety—all are combined in this giant "Pullman of the Air"—the newest forward step in air transportation. Congratulations, American Airlines!

Congratulations, Curtiss-Wright! This "Sleeper Plane" of your design and construction does honor to your engineers, and to your name—already uppermost in the field of aircraft construction.

The Shell Petroleum Corporation takes pride in the fact that test flights of the "Sleeper Plane" were made with Shell Aviation Gasoline—and that it flies now with Shell Aviation Gasoline—on schedule!

"Speed With Safety"

SHELL PETROLEUM CORPORATION
ST. LOUIS, MISSOURI

SHELL

(Continued from preceding page)

TWA, Inc.
Kansas City, Mo.

Route: (j) Newark-Los Angeles, via Philadelphia, Harrisburg, Pittsburgh, Columbus, Indianapolis, Terre Haute, Kansas City, Wichita, Amarillo, Albuquerque and Winslow; 2609 miles. Rate, 24 cents per mile.

Equipment: 1 Douglas DC1, 14 Ford 5-ATB, 2 Ford ATC, 1 Northrop Gamma. Reserve: 40 Douglas DC2, 5 Northrop Gamma, 6 Northrop 4A, 7 Consolidated Fleetster 20A, 2 Lockheed Orion, 2 Lockheed Vega DL1B, 4 Fokker F10A, 1 Stearman C3B.

Officers: President, E. R. Breech; vice-presidents, J. Frye and P. H. Brattain; secretary-treasurer, W. J. Barry. Directors: E. R. Breech, P. H. Brattain, J. T. Smith.

Central Airlines, Inc.
Pittsburgh, Pa.

Route: (k) Washington-Detroit, via Pittsburgh, Akron and Cleveland: 457 miles. Rate, 23.8 cents per mile.

Equipment: 2 Stinson SM6000B, 3 Lockheed Vega. Reserve: 3 Stinson SM6000B, 1 Lockheed Vega.

Officers: President, J. D. Condon; vice-president, R. C. Coulter; secretary-treasurer, J. H. Coulter. Directors: Same and H. S. Dunn, K. H. Blair.

Long & Harmon, Inc.
Dallas, Texas

Route: (l) Amarillo-Brownsville, via Wichita Falls, Fort Worth, Waco, Austin, Houston, Galveston, San Antonio and Corpus Christi; 1125 miles. Rate, 19.75 cents per mile.

Equipment: 4 Stinson Reliant. Reserve: 1 Stinson Reliant, 1 Travel Air.

Officers: President, W. F. Long; vice-president; L. A. Winship; treasurer-secretary-general manager, C. E. Harmon. Directors: Same.

General Air Lines, Inc.
Burbank, Calif.

Route: (m) Salt Lake City-San Diego, via Las Vegas and Los Angeles; 778 miles. Rate, 24 cents per mile.

Equipment: 5 Fokker F10A, 1 Boeing 40B4. Reserve: 2 Boeing 95, 1 Stearman AD.

Officers: President, E. R. Breech; vice-presidents, W. M. Garland and H. M. Hogan; secretary, J. W. Miller; treasurer, J. C. Felli. Directors: E. R. Breech, J. C. Felli, L. R. Beardslee.

Pacific Seaboard Airlines, Inc.
San Bruno, Calif.

Route: (n) Chicago-New Orleans, via Peoria, Springfield, St. Louis, Memphis and Jackson; 903 miles. Rate, 17.5 cents per mile.

Equipment: 3 Bellanca Pacemaker. Reserve: 2 Bellanca Pacemaker, 1 Pitcairn PA-6.

Officers: President-treasurer, C. Putnam; vice-president-secretary-general manager, R. B. Reinhart. Directors: C. Putnam, I. B. Carleton.

Wyoming Air Service, Inc.,
Casper, Wyo.

Route: (o) Cheyenne-Pueblo, via Denver and Colorado Springs; 201 miles. Rate, 35 cents per mile.

Equipment: 2 Stinson S, 1 Stinson SM8A. Reserve: 1 Stinson SM8A.

Officers: President, R. Leferink; vice-president, G. G. Brooder; secretary, H. B. Haselmire; treasurer, A. McLellan. Directors: Same and A. Leferink.

CROSS-COUNTRY SPEED RECORD WITH MAIL MADE

AN AUSPICIOUS inauguration of private transportation of air mail was made by Jack Frye, vice-president of TWA, Inc., when he flew the first load of eastbound air mail on his line since the resumption of private mail service from Los Angeles to Newark in 11 hours 31 minutes, making one 10-minute stop at Kansas City. The flight, made in a Wright Cyclone-powered Northrop Gamma, broke the commercial coast-to-coast record set by the same pilot in a Douglas transport.

Alfred Frank,
Salt Lake City, Utah

Route: (p) Salt Lake City-Great Falls via Helena, Butte, Pocatello and Ogden; 517 miles. Rate, 39 cents per mile.

Equipment: 2 Boeing 40B4, 4 Fokker Super Universal. Reserve: 1 Ford 5-ATD.

Braniff Airways, Inc.
Oklahoma City, Okla.

Route: (q) Chicago-Dallas, via Kansas City, Wichita, Ponca City, Oklahoma City and Fort Worth 955 miles. Rate, 22.5 cents per mile.

Equipment: Five Lockheed Vega. Reserve: 3 Lockheed Vega.

Officers: President, T. E. Braniff; vice-president, E. E. Westervelt; secretary-treasurer, P. R. Braniff. Directors: Same.

Northwest Airlines, Inc.
St. Paul, Minn.

Route: (r) Fargo-Seattle, via Jamestown, Bismarck-Mandan, Dickinson, Glendive, Miles City, Billings, Butte, Missoula, Spokane and Wenatchee; 1286 miles. Rate, 33.75 cents a mile.

Equipment: 2 Lockheed Electra, 3 Lockheed Orion. Reserve: 3 Ford 5AT, 8 Hamilton 47, 2 Travel Air A6000A, 3 Waco 300.

Officers: President, S. M. Archer; vice-presidents, H. H. Irvine, Croil Hunter and F. W. Whitmore; secretary-treasurer, E. I. Wyatt. Directors: Same.

Hanford Tri State Airlines, Inc.
Sioux City, Ia.

Route: (s) Chicago-Pembina, via Milwaukee, Madison, Rochester, Minneapolis, St. Paul, Fargo and Grand Forks; 772 miles. Rate, 19.6 cents per mile.

Equipment: 1 Ford 4AT, 1 Ford 5ATC, 4 Lockheed Vega. Reserve: 1 Sikorsky S-38B, 1 Stearman C-3-R, 1 Stearman C-3-B.

Officers: President, A. S. Hanford, Jr.; vice-president, A. S. Hanford, Sr.; secretary-treasurer, J. B. Murphy. Directors: Same.

The following low bids were rejected for failing to comply with one or more of the Post Office requirements:

Kohler Aviation Corporation, of Grand Rapids, Mich., bidding on a route from Detroit to Milwaukee, via Pontiac, Lansing, Grand Rapids and Muskegon; 265 miles. Rate, 45 cents per mile.

Northern Air Transport, Inc., St. Paul, Minn., bidding on a route from Fargo to Seattle, via Jamestown, Bismarck-Mandan, Dickinson, Glendive, Miles City, Billings, Butte, Missoula, Spokane and Wenatchee; 1,286 miles. Rate, 28.8 cents per mile.

The bid on the Boston to Fort Worth route was rejected because the Post Office Department found it advisable to rearrange the route from Fort Worth to the east in order to provide a more logical, more direct and a more serviceable route, making possible a shorter and more direct east-west route through the southern section of the country to the Pacific Coast, and a more direct and quicker all-air passenger service from the east to Mexico via Brownsville, Texas. Syra Aviation Corp., Syracuse, N. Y., was the low bidder at 29.5 cents.

Bids on the following new routes were opened May 25th:

Boston-Montpelier, via Burlington and Concord and from Boston to Bangor via Portland and Augusta; 410 miles.

St. Paul and Minneapolis-Omaha, via Sioux Falls and Sioux City; Sioux Falls-Bismarck-Mandan, via Huron and Aberdeen; Omaha to Kansas City, via St. Joseph; 902 miles.

Charleston-Fort Worth, via Columbia, Augusta, Atlanta, Birmingham, Meridian,, Jackson, Monroe, Shreveport, and Dallas; 1,087 miles.

Washington-Chicago, via Charleston, Huntington, Cincinnati and Indianapolis; 679 miles.

Billings-Cheyenne, via Sheridan and Casper; 405 miles.

New Orleans-Houston, via Baton Rouge, Lake Charles and Beaumont; 337 miles.

Pueblo-El Paso, via Trinidad, Las Vegas, Santa Fe, Albuquerque; 530 miles.

Daytona Beach-St. Petersburg, via Orlando, Lakeland and Tampa; 158 miles.

Newark-Fort Worth, via Philadelphia,

Baltimore, Washington, Charlottesville, Lynchburg, Roanoke, Bristol, Knoxville, Nashville, Memphis, Little Rock, Texarkana and Dallas; 1,460 miles.

Chicago-Fort Worth, via Peoria, Springfield, St. Louis, Springfield, Tulsa and Oklahoma City; 914 miles.

Boston-Cleveland, via Springfield, Albany, Utica, Syracuse, Rochester and Buffalo; 612 miles.

Cleveland-Nashville, via Columbus, Cincinnati and Louisville; 470 miles.

Detroit-Milwaukee, via Pontiac, Lansing, Grand Rapids and Muskegon; 265 miles.

The last three routes were readvertised. The first two are portions of the Boston, Mass., to Fort Worth, Texas, route as originally advertised. This route, under the rearrangement, has been divided into two new routes and a portion of a third new route.

New England Line Adds to Schedule

ADDITIONAL AIR passenger service between Boston and Burlington, Vt., with intermediate stops at Manchester and Concord, N. H., and at White River Jct., and Montpelier-Barre, Vt., has been established by Boston-Maine & Central Vermont Airways.

The new service of the airways subsidiary of the Boston and Maine road, the Maine Central and the Central Vermont railroads establishes two round-trips of 10-passenger tri-motored Stinson planes daily between Boston and Burlington, with one of the trips extended through in each direction to Montreal.

Eastern Air Starts New Service

LATIN AMERICA was brought nearer to the United States in travel time when Eastern Air Lines, Inc., fourth of the major systems to start air mail service under temporary contracts, inaugurated new passenger, mail and express schedules between Newark and Miami, with 60 per cent of the flying done at night.

For the first time there are overnight schedules for passengers as well as mail and express between the two cities. With the new schedules, a passenger may have dinner in New York one day and by dinner time the next, be in Port au Prince, Haiti.

Two round-trips daily to Miami, one round-trip to Atlanta and seven round-trips to Washington from New York are in effect.

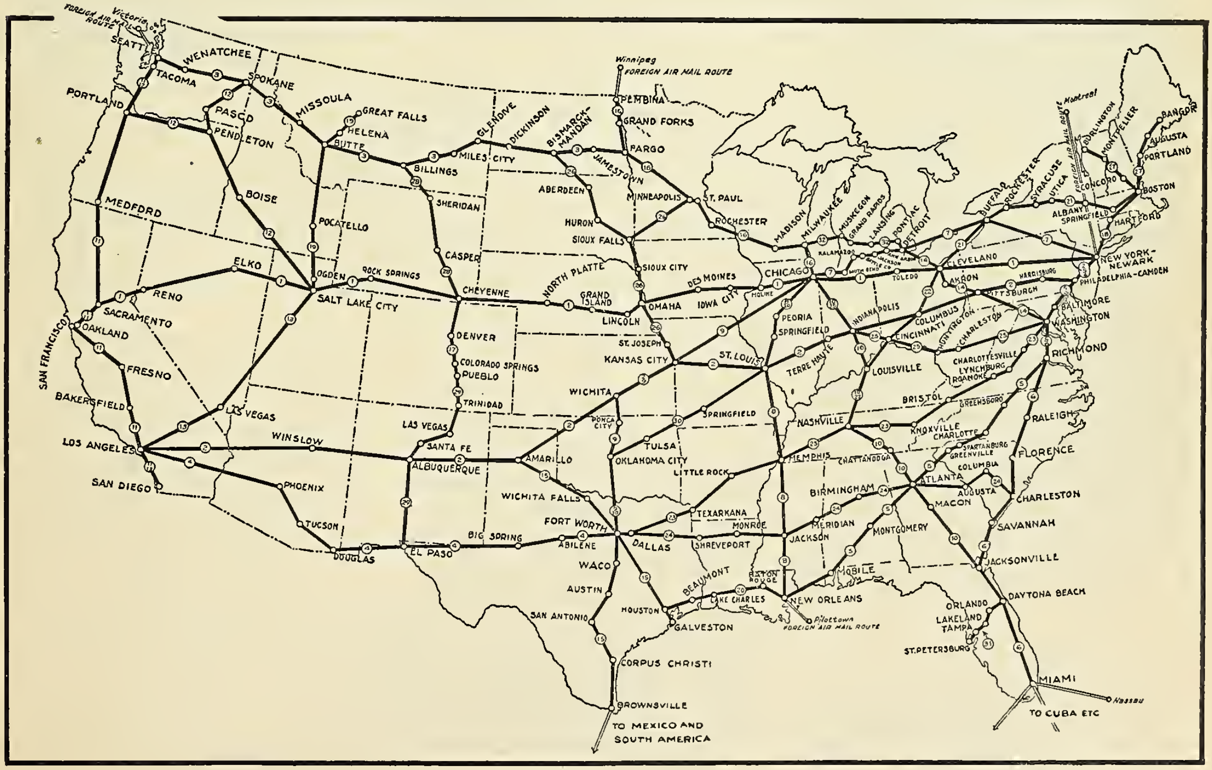
Eastern Air Lines which opened its new Atlanta-New Orleans and Chicago-Jacksonville routes, also announced the resignation of its former president, Capt. Thomas B. Doe, who joined the Sperry Corporation.

Passenger Traffic Decreases

FEWER SCHEDULES on the airlines took their toll in March, when for the first time in a considerable number of months, passenger traffic was lower than the same month of the previous year.

The effects of air mail cancellation is evident in the report of 21 of the 22 scheduled airlines operating in the United States, when they reported that they carried 22,045 passengers in March, 1934. In March, 1933, more than 25,130 passengers were carried. The slower tempo of the air transport field was reflected in the number of miles flown, 2,372,666 compared with 3,679,332 in March, 1933. Only passenger miles flown and the express poundage increased. The former was 8,584,510 miles as against 8,093,535 in March, 1933, while the latter grew from 128,709 pounds in the same month of 1933 to 134,975 pounds in March, 1934.

Although March traffic is usually greater than the previous two months of the year, this March was considerably under the 28,170 and 27,318 passengers carried in January and February, 1934, respectively. Passengers in March, however, seemed to be taking longer trips, since the average ride in that month was approximately 390 miles, compared with approximately 383 miles in January of this year.



Courtesy of the N. Y. Daily News

New airmail map showing the 28,548-mile system which will be flown when all contracts are awarded

NEWS OF THE SCHOOLS

Kenyon College Dedicates Field

PORT KENYON, new flying field operated by Kenyon College, Gambier, Ohio, was officially dedicated and the Wilbur L. Cummings School of Practical Aeronautics opened with appropriate ceremonies as Donald B. Gretzer was installed as flying instructor.

Mr. Cummings, a New York attorney and alumnus of the school, donated all facilities for flying and ground school instruction, including a Fleet and Fledgling training plane, five engines for classroom instruction, a well-equipped hangar, fuselage and wings of a Curtiss Robin and other necessary equipment for aeronautical instruction.

At the ceremonies were a number of Army, Navy and private airplanes and Eugene Vidal, Director of Aeronautics, John Dickinson, Assistant Secretary of Commerce, and Prof. Alexander Klemin, head of the Guggenheim School of Aeronautics, New York University, and technical editor of AERO DIGEST, who made the principal address.

Mechanics School Moves to Field

COMPLETION OF removal of the mechanics' school of Roosevelt Aviation School to Roosevelt Field, Mineola, New York, from New York City was featured by adaptation of a building particularly suited for the work to house the 125 students taking the course.

The building has been prepared for the school and complete equipment installed for instruction in every branch of aviation mechanics. The entire student body of the United School of Aeronautics, formerly operating at Curtiss Valley Stream Airport, has entered the new institution. Classes are given during the day or over week-ends.

School Owners Get Mail Contract

LONG AND HARMON, operators of the Dallas Aviation School, Dallas, Tex., were the successful bidders on the mail contract for three south Texas lines and to meet demands for increased activity are contemplating the construction of an operations office adjacent to the school buildings on Love Field.

Major William Long and C. A. Luckey, chief pilot, flew away from Wayne, Mich., a new Stinson which will be used over the new lines.

Students Build Low-Wing Craft

ONE OF the leading features of the annual exhibition presented by students of the Benson Tech School, Portland, Ore., was the construction of a low-wing monoplane built from plans obtained from the Guardian Aircraft company. The plane, the first to be built by Benson students in their shops, has a wing spread of 35 feet, is 22 feet long and has a steel tube constructed fuselage. All welding was done by the students.

FOUR STUDENTS WIN BOEING SCHOLARSHIPS

FIRST PRIZE in the Fifth Annual Boeing Scholarships went to Donald W. Finlay, student at Oregon State College, entitling him to a complete master pilot course valued at $5,200. Other winners were: second, R. H. Schwarz, Oregon State College; third, F. S. Doyle, Massachusetts Institute of Technology and fourth, M. W. Hedden, Bethany College. A choice of the master pilot ground course or the master mechanic course is available to the second, third and fourth winners, with all courses given at the Boeing School of Aeronautics.

Gliding School Formed

FLYING ACTIVITIES and training in glider flight will shortly be undertaken at Carr School of Gliding, Ottumwa, Iowa, under the direction and tutelage of Stanley T. Carr.

A Detroit Gull will be used to meet present training purposes, but later a secondary training plane will be purchased for the advanced students.

School Fosters Youth's Club

AT A recent meeting of the I. W. Sports Club of the Air, plans were laid for what is proposed to be one of the largest aviation clubs of its kind in the East, an organization aimed to encourage aviation among the younger people. Fred Vilsmeier, president of the Rising Sun Aircraft School, Inc., Philadelphia, Pa., sponsors of this division, appointed Wm. L. Hirst, Director of the Legion Air Races and Vocation Advisor of the school, in charge of the new work.

Membership in the club is free and open to boys ranging in age from 12 to 16. Members will be given an opportunity of studying the fundamentals of aviation as Vilsmeier has granted them the privilege of spending time at the school watching students at their work.

Harrisburg Port Gets School

WITH THE appointment of John Abiuso as manager and pilot of the new Capital City Airways operating at Harrisburg, Pa., airport, plans were announced for the instruction of students.

Capital City Airways will also offer charter service and joy hops in conjunction with its school. Abiuso was formerly chief pilot of the Bloomsburg, Pa., airport and learned to fly in the United States Navy.

Jones Gives Course in RCA Building

THE CASEY Jones School of Aeronautics has moved its training and instrument flying equipment from the Newark Airport into new and larger quarters at 1250 Sixth Avenue, in the R. C. A. Building, where under the direction of Karl Kail, instruction on the Link Blind Flight Trainer will be given in Room 205.

The Trainer has created considerable interest and following demonstrations to a group of prospective students, ten signed up for the course. In addition, demonstrations were given to a group of U. S. Air Corp officers who are in active training at Mitchel Field, Garden City, Long Island, N. Y.

According to C. S. (Casey) Jones, president of the school which has the exclusive nation-wide distribution and operation rights of the Link Trainer, six have been sold to the Army and one to Japan. Other branches of the service have also witnessed demonstrations and have indicated extreme interest in the device.

New Quarters for Parks Students

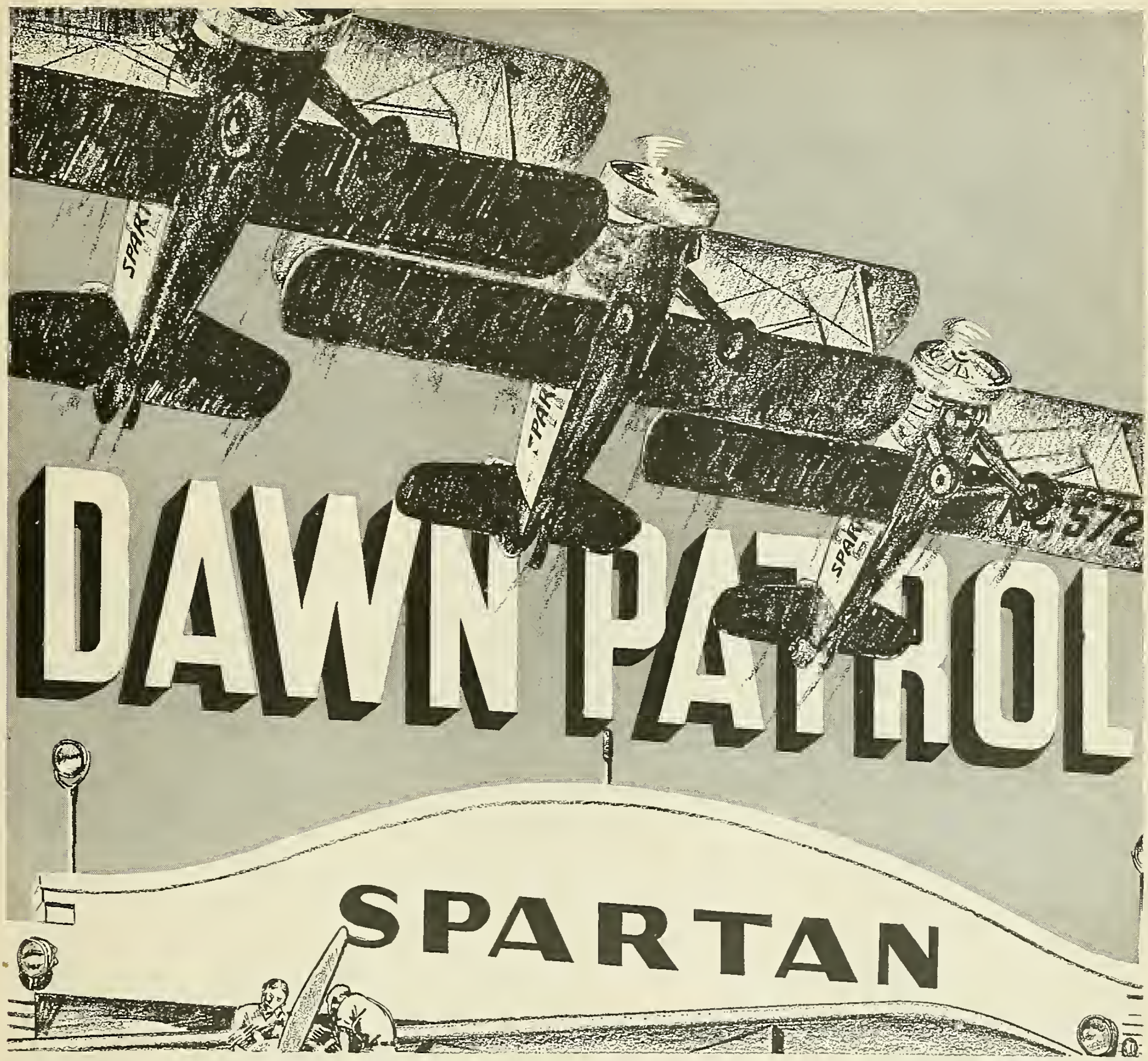
ENGINEERING STUDENTS at Parks Air College, E. St. Louis, Ill., will be housed in a separate building just as soon as it is completed and made ready for occupancy. A building, already located on the airport, will be used. It is 100 feet long, sufficient to contain a large drafting room, an engineering classroom and an office for the dean of engineering and his assistants.

One end of the classroom is slightly elevated, providing a platform for instructors and speakers and ample light is assured through large windows. The wind tunnel will be in a separate steel building a short distance away, with the mechanics' school, in which all practical engineering work is done, nearby.

School Designing New Wing

A SMALL stressed skin wing, designed to be as nearly as possible a reinforced skin rather than a frame wing with metal covering, is being projected in the engineering drawing and design drafting department of the Boeing School of Aeronautics, Oakland, Calif., for construction and static test purposes.

Every effort is being made in the design to develop as nearly as possible a monocoque structure and at the same time to develop a method of manufacture that can be applied to small light aircraft. A. F. Bonnalie, W. F. McGinty, John Thorp and David Retan of the faculty have collaborated in the development of the design, and advanced students are working on it in the drafting room. It is expected that shortly the wing will be released to the metals shop of the school for construction.



COMPARE THESE PRICES

Room Rent FREE with any course during entire period of training. Part time work if desired.

Transport Pilot's Flight and Ground Course	$1,745.00
Limited Commercial Pilot's Flight and Ground Course (Includes Master Mechanic's Ground Course)	520.00
Private Pilot's Flight and Ground Course (Includes Regular Mechanic's Ground Course)	375.00
Master Mechanic's Flight Course (15 Hours Flying)	300.00
Master Mechanic's Ground Course (5 Months)	225.00
Amateur Pilot's Flight and Ground Course (Includes Regular Mechanic's Ground Course)	285.00
Regular Mechanic's Flight Course (15 Hours Flying)	225.00
Regular Mechanic's Ground Course (3 Months)	135.00

The ECONOMICAL School!

JUNE 1st, 2nd and 3rd, the Spartan DAWN PATROL of fifteen ships, on the first Spring cross country flight were guests of the American Legion and Chamber of Commerce at Paris, Texas. In connection with the cross country instruction flights of the DAWN PATROL, this city is visited at least twice each year, as are other cities throughout the Middle West, North and South. On June 12th the DAWN PATROL will accompany the 1,300-mile Oklahoma State Air Tour, which will consist of over fifty ships, visiting forty-three airports throughout the State. Among the pilots will be Jimmy Doolittle, Jimmie and Mae Haizlip, Wiley Post, Jimmie Mattern, Wedell and his "400," Ben Howard with "Ike" and "Mike," Art Goebel, Roy Hunt and an Army formation of A-12 attack planes. Come—take your place in the DAWN PATROL, learn the thrill of aviation instruction as taught by SPARTAN—the Modern School! Prepare yourself for a definite place in Aviation with the only commercial flying school in the world government approved, that has invested over a MILLION DOLLARS to bring you the new SPARTAN 3 STAR * * * Flying Courses. Now! learn in practical daily contact with all that is most advanced in Aviation. Instruction that goes beyond the class room. You learn actual Factory Production Methods and study in busy Repair Shops. In the air you fly with the DAWN PATROL, famous throughout the nation. Learn more now about this new interesting method of instruction that is preparing Spartan Students to become to-morrow Aviation's Brightest Stars. Write for a copy of the Spartan Catalog outlining aviation's most modern aeronautical courses.

Spartan
SCHOOL OF AERONAUTICS

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• THE AIR SERVICES •

Navy Revises Aviation Rules

A GENERAL order issued by the Navy Department has divided general aviation training in four categories aiming to foster personal familiarization with aviation on the part of all naval officers so that the sea and air forces of the Navy may be more closely coordinated.

The orders provide for basic instruction at the Naval Academy; elimination flight training at designated naval air stations to determine the qualification of candidates for the primary course at the Naval Air Station, Pensacola, Fla.; primary and advanced flight course for qualification as naval aviator, naval aviation observer and naval aviation pilot at the Pensacola station and familiarization training for non-aviation officers.

Training at the Naval Academy will consist of instruction in aviation subjects and flight observation training to provide all future naval officers with a general understanding of aviation and to give them an idea of its possibilities and limitations as a unit of the fleet. As for familiarization training for non-aviation officers, the Department states that it is its desire that all line officers have personal flight experience as a basis on which to judge and appreciate the potential value and limitations of aircraft in naval warfare. With this end in view, force commanders and commanders of naval districts are authorized to give familiarization courses to such officers that may request it, providing such request does not interfere with routine scheduled operations and funds for the costs in connection therewith are available for the purpose.

Navy Purchases Two Condors

TWO CURTISS-WRIGHT Condors have been purchased from the Curtiss-Wright Airplane Co., Robertson, Mo., by the United States Navy for administrative use, one of which has already been delivered to Anacostia.

Rear Admiral Ernest J. King and Admiral William H. Standley were flown in the Condor, and after witnessing Fleet maneuvers in the Caribbean, flew from Miami to Washington, visiting, en route, the Naval Air Station at Pensacola, the naval aviation facilities at Parris Island, the Norfolk, Va., Naval Air station and the Charleston Navy Yard.

The new Navy Condors have a top speed of 190 m.p.h., and cruise at 160 m.p.h. They are powered by Wright Cyclone engines of 715 h.p.

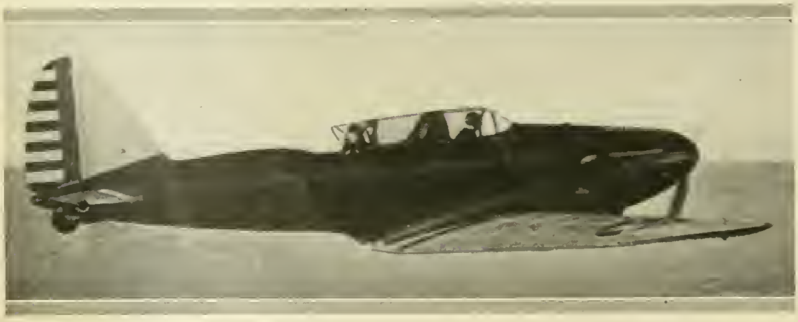
ARMY MAIL PLANES SET FAST COAST-TO-COAST PACE

THE LAST mail run from Oakland to Newark flown by the Army Air Corps before turning the service back to the commercial carriers, was the fastest ever made with mail. Although six stops were made to refuel, change mail or shift planes, the mail came through in 13 hours 53 minutes, slightly higher than the present commercial record of 13 hours 4 minutes made by a Douglas transport, which, however, carried no mail. A few days later the Army's record was also broken by the TWA Gamma.

Repair Base at Spokane Considered

AN ARMY AIR Corps depot base at Spokane, Wash., may be developed if a bill prepared by Congressman Samuel B. Hill is approved. The bill calls for authorization of the base and the appropriation of $1,000,000 for shops; a similar amount for improvement to runways and lighting facilities and another large appropriation for hangars, facilities and living quarters.

It is planned to make the Spokane base a center of repair and servicing units where all types of planes could be reassembled and repaired within the protecting confines of the city which is away from the coastline and fortified by the Cascade mountains.



New Conqueror-powered two-place pursuit plane built by Consolidated Aircraft Corporation

Woodring Proposes Army Program

A PROPOSAL calling for the expenditure of more than $30,000,000 and the purchase of nearly 1,000 planes has been launched by Assistant Secretary of War Harry H. Woodring. If accepted, the plan would revolutionize the methods by which airplanes are purchased by the Army and result in rapid advancement in military aviation, Woodring said.

Curtailment of the Air Corps engineering plant, school and laboratories at Wright Field and inauguration of a design competition for military craft open to all designers and engineers are among the items in Woodring's plan. In addition, the proposal calls for immediate purchase of approximately 150 planes with the $9,000,000 available from PWA funds and the remainder of the Army's 1934 appropriation; immediate advertisement for the purchase of 300 or 350 planes to be bought out of the 1935 appropriation and $3,000,000 allotted by Congress ($11,000,000 in all); immediate advertisement, for opening in 1935, for the purchase of 300 to 350 planes of all types from the 1936 appropriation which the Air Corps estimates will total about $12,000,000.

Under this program, bids have been called for 80 bombers, specifications of which call for multiple motored planes of at least 750 horsepowered engines (either Pratt & Whitney or Wright).

New Carrier Commissioned

THE 13,800-TON *Ranger*, newest aircraft carrier of the United States Navy, was commissioned at Newport News on May 26 and left immediately for her fitting out period, tests and trials at sea, operating from a base at the Naval Operating Base, Norfolk, and from Hampton Roads.

Capt. Arthur Leroy Bristol, recently returned from London as Naval Attaché, has been named commanding officer of the vessel, which will carry 72 planes of various types.

After a few months of tests and trials, the *Ranger* will report for duty some time after October 15.

Marine Fliers in War Games

TWENTY-FIVE U. S. Marine Corps planes, under the command of Lt. Col. Ross E. Rowell, participated in the Caribbean war maneuvers after flying in formation to San Juan, Puerto Rico. Ten of the planes left Quantico and were joined by the rest along the route. The flight was the longest movement of landplanes ever undertaken by Marines.

More than 300 Navy planes and the U. S. S. *Macon* also took part in the maneuvers, after which 31 flew to Coco Solo for a scheduled formation flight.

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PRIVATE FLYING and CLUB NEWS

Air Meet Held at College Park

ONE OF the most successful amateur competitive flying meets ever held was staged at College Park Airport, Md., May 6, when 47 pilots and 33 airplanes entered 12 events sponsored by the Washington Air Derby Association in celebration of Langley Day. H. A. Little, Philadelphia, took first place in three races for planes of various speed ratings while second honors went to Buddy Somerville of Washington who took a first place, two seconds and was a member of the winning relay team.

Among the successful women pilots was Miss Edna M. Gardner, Washington nurse, who took two first places and was on the winning relay team.

The number of planes entered represented an increase of 40 per cent over the Langley celebration a year ago, and while there were 33 planes competing, 65 were on the field. More than 7,500 persons witnessed the events from the grandstand and parked automobiles who saw continuous flying from midmorning to sunset.

Prizes were donated by Washington civic, trade and business organizations. Among them was the Washington Air Derby Association Trophy which went to Chester H. Warrington, president of the association, whose work in promoting the Langley meets and other events for sportsman pilots won him the honor.

Among the winning planes were a Fleet, Monocoupe, Robin, Travel Air, Aeronca and a Spartan.

Air Club Elects Officers

AVIATION INTERESTS of Northern Indiana and Southern Michigan met in South Bend for the annual gathering and banquet of the St. Joseph Valley Aviation Club. An election of officers and talks by prominent aviation people featured the conference.

Officers for the ensuing year were elected as follows: Dr. C. L. Snyder, president; Sterling Pierce, vice-president; Carl Folsum, secretary; William Ames, treasurer; O. H. Collmar, Everett Calvert and James Hutchenson, directors. Interesting addresses were made by Prof. H. G. McComb of Purdue University; J. R. Cautley, Bendix Aviation Corp., and W. A. Goodyear, of American Airways.

40 PILOTS EXPECTED AT MENOMINEE RACES

PLANS ARE under way for the 1934 Legion Air Races at the Menominee County Airport, Mich., when a racing program on will offer three events over a 30-mile course. More than 40 pilots are expected.

35 Cities Listed in Tour

THE TENTATIVE itinerary for the 1934 Michigan Air Tour, issued by Sheldon B. Steers, president of the air tour association and assistant director of the State Board of Aeronautics, lists thirty-five cities which will be visited during the six-day trip.

Planes in the tour, which will be more in the nature of an inspection trip of airports that have been improved through the CWA program, will take-off from Lansing and visit, tentatively, in order Alma, Midland, West Branch, Houghton Lake, Mio, Atlanta, St. Ignace, Rexton, Blaney, Mahma, Escanaba, Crystal Falls, Sidnaw, Laurium, Ontonagon, Ironwood, Ewen, Three Lakes, Ishpeming, Munising, Newberry, Two Hearted River, Raco, Soo, Rudyard, Hessell, Cheboygan, Petoskey, Charlevoix, Bellaire, Traverse City, Kalkaska, Cadillac and Baldwin.

The dates of the tour are set for July 22 to 28, inclusive.

Grover Loening's new Wright Whirlwind-powered amphibion for private use

Women's Race at Roosevelt Field

THE THIRD Annual Annette Gipson All-Women's Air Race to be held June 24 at Roosevelt Field, Mineola, N. Y., will feature a 30-mile closed course race and an all-women's acrobatic contest under the management of Miss Gipson, who is also a private pilot. There will be no admission charge to the public and no entry fee required of the contestants. Cash and other prizes donated by Mrs. I. J. Fox, chairman of the contest committee, will be awarded.

The race is open to women holding any Department of Commerce license (except solo and amateur), an F. A. I. certificate and a 1934 Annual Sporting License. The air race management is now soliciting out-of-town Chambers of Commerce, airports and newspapers for cooperation in making possible the entry of pilots who at present have no available ships for the race. Free hangar space will be provided for all participants.

Col. Clarence M. Young has consented to act as referee, while other officials of the race include Amelia Earhart, starter; Ruth Nichols, chief scorer; Jack Bishop and Alexander de Seversky, timers; Clarence Chamberlin, Prof. Alexander Klemin and F. William Zelcer, technical committee and Louis de Florez, James B. Taylor, Jr., Hugh Copeland, Clyde Pangbor and Bennett Griffin, handicapping committee.

The general committee includes a large group of persons well known in the aeronautical industry.

Buys Plane to Commute

MR. AND MRS. M. D. King, Hollywood, Calif., are taking flight training courses with Ace Bragunier, Dycer Flying Service, Dycer Airport, who reports both to be apt students and capable of developing into excellent pilots. Mr. King has purchased a Wright J-5 Eaglerock for business use.

Loening Flies From Florida

GROVER LOENING flew his new monoplane amphibion from Florida to New York, completing a service test of more than 150 hours which showed the plane to cruise about 30 m.p.h faster than the old Loening Commuter type from which it was developed. On the trip north an average cruising speed of 110 m.p.h. was made.

After installation of a controllable pitch propeller, Loening will continue to use the plane for further test and development work. The plane features new-type NACA short span ailerons with a 9° down movement and a 50° up movement, providing effective lateral control.

During the past winter, Mrs. Loening made many flights from Miami.

No PARKING PROBLEMS *here*

Equip your ship with EDO Floats and park it just as you would a canoe—within handy reach. Enjoy the immensely broadened range, the all-purpose utility of over-water flying with a quickly convertible seaplane.

In recreation or business—in flights to the centers of great cities that border the water, smart seaside resorts, pine-cloistered lakes—the endless waterways are your landing places. EDO's may even be docked on a beach.

The maneuverability, performance and sturdy dependability of your EDO Floats will be exactly the same as those which have crossed the Atlantic and Pacific, which are right now defying the rigors of Antarctic service.

Sportsmen and women, business men, enterprising operators will prepare now for a great flying season. Write for complete information on float gear for your plane, including a list of the scores of popular makes of ships for which EDO all-metal Floats are standard licenseable equipment. EDO Aircraft Corp., 610 Second Street, College Point, Long Island, N.Y.

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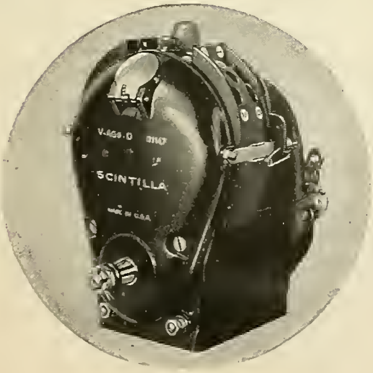
Makers of Wasp and Hornet Engines



SCINTILLA MAGNETO CO., *Inc.*
Sidney, New York
Contractors to the U. S. Army and Navy
(Subsidiary of Bendix Aviation Corporation)

AT THE AIRPORTS

5,000 Attend Pocatello Meet

AN AERIAL circus staged at the Pocatello, Idaho, airport drew 5,000 persons who witnessed a program of aerial maneuvers and parachute jumping. Among the pilots present were Earl Hughes, Department of Commerce Inspector; A. C. Blomgren, state aeronautical engineer; Buddy Bruce, parachute jumper and Ralph Knapp.

Consolidation of CAM 5 and 26 with Pocatello as a coordinating point is being urged as an aid to the residents in eastern Idaho and western Wyoming for which the city is a transportation center.

Resort Port May Be Air Base

RECENT APPROVAL by the Aeronautics Branch of Great Island as an airport site and possible air base for the U. S. coast defense was seen as a good sign that Atlantic City may soon get a new airport. The plan to convert Great Island and Lakes Bay into a combination land and sea terminal has been studied for some time.

If federal aid can be obtained, the work of converting the site will be started this summer. Sand dredged from Lakes Bay would be used to fill in Great Island, giving the former a deep enough waterway for small craft and seaplanes and the latter a good-sized field for land planes.

Alaska-Seattle Service Popular

CONSIDERABLE INCREASE in business has been felt this spring by Alaska Southern Airways which operates on Lake Washington, near Seattle. According to Nicholas Bez, president, traffic was showing a 50 per cent inincrease this year over last on the company's six-hour service between Alaska and Seattle.

Airport Lease Abandoned

OZARK AIRWAYS, Inc., operating lessee of the Municipal Airport, Springfield, Mo., has informed city officials that it will not operate the airport after the first of this month. The airport has been leased on a monthly basis since December, 1933.

George Prescott, president of the company, said that he is considering removal to another city.

Flying Club Leases Field

SANTA CRUZ airport has been leased from the city by the Santa Cruz Flying Club, Inc., for a period of five years, during which time the organization will be in charge of airport management, improvement, maintenance and financial returns from the field. There are four small and one large hangars on the field, besides the club house and other equipment, and plans are being made for a formal dedication of the field in the very near future when Governor Rolph is expected to officiate. Hollis Peck is the club's president.

1,000 RIDERS SET RECORD AT DETROIT AIRPORT

MORE THAN 1,000 persons took sightseeing trips over Detroit one Sunday recently, setting a record for this type of flying for all times, except during the aircraft shows. Seven planes were kept busy to satisfy the flight desires of the crowd at the field.

Norwich Airport Being Improved

TWO NEW runways are being built at the Norwich, N. Y., airport under the direction of S. K. Johnson. One runway will be 2,000 by 100 feet while the other will measure 2,500 by 100 feet.

More than $25,000 has been appropriated for the work which is expected to be completed early this month.

Ohio Airport Activities

APPOINTMENT OF Carl I. Friedlander as traffic manager of the Vermilya-Huffman Flying Service, Cincinnati, Ohio, and the election of M. Parks Watson as president of the Watson Airport, Inc., of the same city, featured recent airport activities in the state of Ohio.

Friedlander will devote his activities to the development of the Vermilya-Huffman services and to the promotion ends of the company. Along with the election of Watson, Allen R. Josline was chosen vice-president; M. Herbert Oettinger, secretary-treasurer and C. W. Deforest and C. H. Tobias, directors.

In addition, the H. W. Air Service, Inc., received incorporation papers to conduct a business at Beechwood. Incorporators are R. H. Burgess, Clara Morgenstern and Erma Herr.

Dayton Leases Airport

HOWARD G. MAYES, airport operator, has sublet from the city of Dayton, Ohio, the airport at Vandalia which was recently city-leased from E. A. Johnson for a period of five years. Mayes also operates Huntington Field, Chesapeake, Ohio, and is dealer for Waco and other planes.

The city is seeking funds from the government to improve the field. Present operations include all branches of flying while bids have been submitted for an upper air Weather Bureau observation station. If these bids are accepted a Wright J6-9 Travel Air will be used to conduct daily altitude flights.

New York to Have Air Carnivals

EVERY SATURDAY, Sunday and holiday this summer will witness the performance of an air show by members of the Greater New York Air Carnival at Floyd Bennett Airport, according to F. William Zelcer, Director of Aviation of the City of New York. The flying group, consisting of some of the country's outstanding race and acrobatic pilots, has leased the field and arranged for accommodating 12,500 persons in grandstands.

Among the fliers in the group are George Burrell, Art Davis, Roy Hunt, Harold Neumann, Jack Wright, Clem Sohn and Bennett Griffin.

Mr. Zelcer said that during the races the "open and closed" panel system will be used to regulate traffic on the field, and landing direction will be indicated by the large airport "Tee." Income derived from the lease will not only more than provide for maintenance and operation of the airport, but also give the city the finances for necessary field improvements, Mr. Zelcer said.

Vicksburg Airport Dedicated

WITH A CROWD of more than 5,000 attending, the dedication of the Vicksburg, Miss., municipal airport took place. A program of flying featured the exercises.

The Flying Aces performed with six planes under the auspices of the Allen Post, American Legion while Alderman J. J. Williamson, chairman of the airport committee acted as master of ceremonies. Major John O'Keefe, federal airport advisor for Mississippi, guest speaker, called attention to the various improvements at the field which placed it in such splendid shape.

The flying exhibition included parachute jumps, inverted flying, wing walking and precision flying.

Unger Resumes Activity

UNGER AIRCRAFT, Inc., has renewed its flying operations at Shore Airport, located on state highway 35, near Brielle and Manasquan and six miles from Asbury Park, N. J. Two licensed mechanics will be available for repair and service work and gas and oil will be sold on the airport.

Matty Seleski, who has been associated with the corporation for a number of years, will be manager of the airport.

Agency Opens Coast Office

PACIFIC AIRCRAFT Sales Co., recently appointed California distributors of Fairchild aircraft, has opened sales offices at United Airport, Burbank, with Norman Larson, who recently joined the organization as partner, in charge. The company, founded in 1932 by Ivar Akselsen, also handles the sale of used aircraft.

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FOR ALL KNOWN USES

KEYSTONE COPPER STEEL
AMERICAN SHEET AND TIN PLATE COMPANY PITTSBURGH

In Aviation Fields

Use sheet metal products of recognized reputation and value for hangars, shops, sheds, culverts, and similar purposes.

Insist upon AMERICAN Black Sheets, Keystone Rust Resisting Copper Steel Sheets, Apollo Best Bloom Galvanized Sheets, Galvannealed Sheets, Heavy-Coated Galvanized Sheets, Formed Roofing and Siding Products, Tin Plates, Terne Plates, Black Plate, Etc.

Write us relative to your sheet steel requirements. This Company also manufactures U S S STAINLESS and Heat Resisting Steel Sheets and Light Plates for all purposes.

AMERICAN SHEET AND TIN PLATE COMPANY, Pittsburgh, Pa.

SUBSIDIARY of UNITED STATES STEEL CORPORATION

A Privateer Amphibion on a pleasure jaunt arrives at Atlantic City

They Look Happy, Don't They?

Well, you would too if you had just sat down at Atlantic City—an hour after taking off from New York—for a sunshine week-end of rest and recreation. You can take off from land or water anywhere and sit down on land or water anywhere when you own a

PRIVATEER . . THE PERSONAL PLANE

For speed, safety and comfort, for business and for pleasure, the Privateer Amphibion is the only plane of its kind in America. A cozy three seater with all the stamina of an airliner, it is the perfect private plane.

AMPHIBIONS

ROOSEVELT FIELD (INCORPORATED) GARDEN CITY, N. Y.
PHONE: GARDEN CITY 5500

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SUPERIOR PROPELLERS GIVE SUPERIOR PERFORMANCE

The unqualified endorsement of the hundreds of pilots now using these products definitely places MARSHALL FAHLIN PROPELLERS at the head of the list of quality propellers.

Enthusiastic pilots praise the efficiency of Marshall Fahlin Propellers under varying conditions ranging from the higher altitudes of the mountainous sections to the more favorable altitudes of the middle west and other lower sections.

Recognized as products of quality, Marshall Fahlin Propellers are unconditionally guaranteed from the standpoint of materials and workmanship, and all designs in regular production are approved by the Department of Commerce. Remember, not just a STICK but a real propeller justifying your supreme confidence.

"MARSHALL" Fahlin PROPELLERS
MFD EXCLUSIVELY FOR NICHOLAS-BEAZLEY AIRPLANE CO. INC. MARSHALL, MO.

As Nearly Perfect As Excellent Workmanship and Selected Materials Can Make Them

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1300 No. San Fernando Rd.
Glendale, Calif.

THE INDUSTRY IN GENERAL

Electra Orders Increasing

WITH THREE months of flight testing nearing completion, the first Lockheed Electra was being prepared for delivery to Northwest Airlines, and the Lockheed Aircraft Corp., Glendale, Calif., was rushing production on 18 additional planes for which definite contracts were on hand, according to Carl B. Squier, vice-president and sales manager.

The first production unit going through the factory consists of eight Electras, the first two of which are scheduled for delivery shortly to Northwest Airlines. The next six will go to Pan American Airways, for its Mexican affiliate, Aerovias Centrales, while seven more were ordered by Nederlandsche Vliegtuigen Fabriek Fokker, Amsterdam, Holland, Anthony H. G. Fokker's international aircraft distributing organization.

An executive model Electra has been ordered by the Phillips Petroleum Company for the use of Frank Phillips. Navigation aids will include a Westport receiver and Western Electric two-way communication equipment. The first sportsman to purchase an Electra is Walker P. Inman, Summerville, N. J.

With a production schedule calling for the completion of nearly three Electras per month, the factory now has more than 400 employees on its payroll, and plant facilities have been increased by the erection of a new building making available an additional 10,000 square feet of floor space.

Stinson Airliner Test Flown

PRELIMINARY TEST flights of the new Model A Stinson Airliner were completed last month and final test work is now under way, according to B. D. DeWeese, president of the Stinson Aircraft Corp., Wayne, Mich.

The result of 18 months of effort, the new transport exceeded the expected 150 mile per hour cruising speed. The combination of gull-wing, braced-wing construction with a wide fuselage was responsible to a great degree for the increase in speed and in better take-off and climb characteristics with the sesqui-spar wing, an improvement over former types built.

Quantity production of the Model A is expected to begin just as soon as final approval is obtained for it.

NATIONAL AIR RACES MAY RETURN TO CLEVELAND

IF SUFFICIENT underwriting can be obtained within a reasonable time, this year's National Air Races will be held in Cleveland which has an option on the annual classic. As yet nothing definite has been decided, but the directors of the National Air Races of Cleveland, Inc., the underwriting group sponsoring the event in that city, expect to meet shortly to decide whether a $100,000 budget can be met.

Airster Dealers Chosen

TWO ADDITIONAL distributorships for Security National Aircraft Corp., Downey, Calif., have been announced by William B. Kinner, president of the corporation.

James Lund, Price, Utah, has taken delivery of his first Security Airster, a new 100-horsepowered folding wing sport ship designed by Mr. Kinner as has Northwest Aircraft, Inc., Portland, Ore., through Art Whitaker, general manager.

New Hornet Powers Speed Plane

THE NEW records established by Col. Roscoe Turner are being made in a racer equipped with a special P. & W. Hornet.

The engine, No. 1853, which has a displacement of 1,690 cubic inches and at racing speeds develops upwards of 900 horsepower, enabled Turner to make a 550-mile Detroit to New York flight in 1 hour 47 minutes, or an average of 310 miles an hour, during which, Turner said, the plane was never extended.

Included in the equipment on the plane and engine are Bendix wheels and brakes and Hurley-Townsend spark plugs.

Roscoe Turner's record-breaking P. & W. Hornet-powered Wedell-Williams racer

Approved Type Certificates Awarded

The Department of Commerce, Aeronautics Branch, has issued approved type certificates covering four models of aircraft and five models of aircraft engines as follows:

Taylor Aircraft Corp., Bradford, Pa., model Cub F2, 2-place open-closed land monoplane powered by an Aeromarine AR340, 40 h.p. engine. Weights: Empty 536, useful load 407, gross 943. A. T. C. No. 525.

Fleet Aircraft Corp., Buffalo, N. Y., model 11, 2-place, open-land biplane, powered by Kinner R5, 160 h.p. engine. Weights: Empty 1155, useful load 625, gross 1780. A. T. C. No. 526.

General Aviation Manufacturing Corp., Dundalk, Md., model Clark GA43A, 12-place closed land monoplane, powered by Wright Cyclone R1820F, 715 h.p. engine. Weights: Empty 5283, useful load 3467, gross 8750. A. T. C. No. 527.

Monocoupe Corp., Moline, Ill., model D145, 2-place closed land monoplane, powered by Warner Super Scarab 145 h.p. engine. Weights: Empty 1220, useful load 628, gross 1848. A. T. C. No. 529.

Lycoming Manufacturing Co., Williamsport, Pa., model R680-5, 9-cylinder, radial, air-cooled. Rated 260 h.p. at 2300 r.p.m. Octane 80 required. A. T. C. No. 110.

Lycoming, model R680-6, 9-cylinder, radial, air-cooled. Rated 245 h.p. at 2300 r.p.m. Octane 58 required. A. T. C. No. 111.

Lycoming, model R680-7, 9-cylinder, radial, air-cooled. Rated 240 h.p. at 2300 r.p.m. Octane 58 required. A. T. C. No. 112.

Continental Aircraft Engine Corp., Detroit, Mich., model R670B, 7-cylinder, radial, air-cooled. Rated 225 h.p. at 2000 r.p.m. Octane 80 required. A. T. C. No. 120.

Jacobs Aircraft Engine Co., Pottstown, Pa., model L4, 7-cylinder, radial, air-cooled. Rated 225 h.p. at 2000 r.p.m. Octane 73 required. A. T. C. No. 121.

Cessna Working on New Model

SHOP WORK has started on the new model to be introduced this summer by Cessna Aircraft Co., Wichita, Kan., according to Clyde V. Cessna, president. Wings and fuselage of the new plane are now under construction.

The new Cessna is to be a four-place cabin monoplane, powered with the 145-horsepower Warner engine, and will incorporate a retractable landing gear and wing flaps. Cessna cantilever construction will be used throughout.

Work on the ship will progress slowly, Mr. Cessna said, since new jigs and tools will have to be made for the plane which will be larger than recent Cessna models.

(Continued on following page)

Fleet Trainer, equipped for instrument flying.

STUDENT
INSTRUCTION

Blind flying in ships equipped with Stromberg-Carlson Aircraft Radio

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CHARTER SERVICE

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Primary instruction given in Fleets; advanced instruction available in larger equipment

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STREAMLINE ■ SQUARE
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● Macwhyte makes a complete line of highest quality tie rods—streamline for external bracing, square and round for internal bracing—together with standard and safe lock terminals. Standard equipment on most of America's aircraft.

Macwhyte Company
Kenosha, Wisconsin

The Private Utility Plane of 1934

Presenting the New DeLuxe Model 90

Monocoupe

Registered Trade Mark

POWERED WITH THE LAMBERT R-266 90 H.P. ENGINE

Flies *120 miles* in an hour on only *5 gallons* of gas! Top speed—140

Sensational, unique developments of design and many refinements are incorporated in the new DeLuxe Model 90 Monocoupe. Specially designed flaps on the trailing edge of the wing are one of the sensational features. The flaps reduce the landing speed and run of the plane, decrease the take-off run and permit safe and practical operation from much smaller fields.

The flaps are lowered or raised in *one second* by a positive push-pull control inside the cabin, independent of all other controls. *No winding.*

Extra Performance with Wing Flaps

TAKE-OFF—FULL LOAD

Without flaps	428 feet—12 seconds
With flaps	328 feet—10 seconds

LANDING RUN—FULL LOAD

Without flaps or brakes	400 feet
With flaps but no brakes	162 feet
With flaps and brakes	100 feet

Such exceptional performance, plus refinements which add to flying comfort, ease and utility, make the DeLuxe Model 90 the outstanding private utility plane of the year, and ideal for many commercial uses. Specially designed tunnel cowling reduces head resistance and contributes largely to even higher Monocoupe performance. Redesigned stream-shielding permits wider angle vision. The cabin is *eight inches wider*. The seat is placed farther forward of the rear wing spar, and the door is much wider. The larger instrument panel accommodates extra flight instruments if desired. See list of equipment.

Write for complete details of the new DeLuxe Model 90 priced at $3485. Three other models: Standard Model 90—$2885; Model 125—$4485; Model D-145—$5600.

EQUIPMENT—Standard equipment includes wheel pants, tunnel cowling, wing flaps, parking brake, steel propeller, clock, magnetic compass, altimeter, airspeed indicator, tachometer, oil temperature indicator, oil pressure gauge, 6.50 x 10 semi-air wheels and brakes, dual controls, fire extinguisher, log books, tools; first-aid kit, and wiring for navigation lights.

Nearly 1,000 Monocoupes built and sold.

LAMBERT AIRCRAFT CORPORATION
LAMBERT FIELD, ROBERTSON, MISSOURI

SUBSIDIARIES:

Monocoupe Corporation
Robertson, Missouri.

Lambert Engine & Machine Co.
Moline, Illinois.

(*Continued from preceding page*)

SKF Moves Offices from New York

EXECUTIVE OFFICES of SKF Industries, Inc., have been removed from New York City and consolidated with the Philadelphia plant, where closer liaison will be maintained between executive, sales, engineering, research and production departments of the company.

SKF renders scientific studies and advises in anti-friction problems and design and its world-wide organization maintains six research laboratories. 15 plants and 250 factory branch offices throughout the world. Primarily, SKF manufactures ball and precision bearings.

Army Approves New Cyclone Rating

FOLLOWING COMPLETION of a 150-hour endurance test at the Army research laboratories, Wright Field, Dayton, Ohio, the Wright Cyclone F engine has been approved for an Air Corps service rating of 750 h.p. at 1950 r.p.m. at sea level, said to be the highest rating ever approved by the Army for a single-row, radial, air-cooled engine.

Westinghouse Appoints Manager

C. J. BURNSIDE has been appointed manager of the Radio Engineering Department of the Westinghouse Chicopee Falls Radio Division and will devote his time to the design and manufacture of police, aircraft and government radio apparatus, chief products of that plant.

Burnside has been associated with radio departments of the Westinghouse company since his graduation from South Dakota School of Mines in 1924.

(*Continued on following page*)

Digest of Recent Events

S-42 Establishes New Altitude Records

TWO NEW records were apparently captured by the new Pratt & Whitney powered Sikorsky S-42 flying boat built for Pan American Airways, when Boris Sergievsky flew to 16.000 feet with a load of 16.500 pounds while conducting test flights at Bridgeport, Conn. Previous records, held by Germany, were for carrying 14,200 pounds to 6.561 feet and for carrying 11,023 pounds to the same altitude. In speed tests, the Sikorsky made 181 miles an hour. APRIL 26

Mlle. Hilz Finishes Paris-Tokio Flight

HER SECOND successful round-trip flight between Paris and Tokyo was completed by Marsye Hilz, French aviatrix and recent winner of the Harmon prize, when she landed at Le Bourget, 5 days 9 hours 5 minutes out of Saigon, setting a new record for the distance. The total trip of about 18,750 miles was made in an all-metal Breguet powered by a 650 h.p. Hispano Suizan engine. APRIL 28

Australians Claim Long Flight Record

A NEW Australia-England flight record of 8 days 12 hours was claimed by Bernard Rubin and Kenneth Woller. Australian fliers who landed at Lympne airport 9 hours 25 minutes earlier than the previous record established by Jimmy Mollinson. The plane is being prepared for the MacRobertson Race. MAY 1

Turner Breaks Mark on Detroit-Pittsburgh Hop

CROSS - COUNTRY speed records were broken by Col. Roscoe Turner when he flew his new racer from Detroit to Pittsburgh in 48 minutes 19 seconds, averaging about 329 miles an hour for the 271-mile flight. Turner took off from the Wayne County airport and landed at the Allegheny County Municipal port. MAY 3

Italian Woman Flier Climbs 18,222 Feet

THE ITALIAN Ministry of Aviation officially announced that the Marquise Carina Negrone di Cambiaso flew a seaplane to an altitude of 18,222 feet, a new international women's seaplane record. The former record was held by Mrs. Marion E. Conrad, an American, who reached a height of 13,461 feet. MAY 7

Detroit-New York Record Set by Turner

ROSCOE TURNER continued to set point-to-point speed records by flying between Detroit and New York, a distance of approximately 550 miles, in 1 hour 47 minutes 21 seconds, beating the former record, held by Commander Frank Hawks at 2 hours 26 minutes. Turner flew his new Pratt & Whitney-powered racing low-wing plane. MAY 11

Commercial Plane Mark Broken by TWA Official

JACK FRYE, vice-president of TWA, Inc., flying mail from Los Angeles to New York, broke the transcontinental speed record for transport planes by covering the distance in 11 hours 31 minutes in a Wright-Cyclone powered Northrop Gamma. More than 350 pounds of mail and 85 pounds of express were carried in the plane, which at times reached 14,000 feet and averaged about 227 miles an hour. One stop, for 10 minutes, was made in Kansas. MAY 13

Trans-Atlantic Flight Falls Short of Goal

ALTHOUGH THEY successfully crossed the Atlantic Ocean, George R. Pond and Cesare Sabelli failed to reach their goal, Rome. The fliers took off from Floyd Bennett Field, New York municipal airport, and after more than 32 hours in the air, brought the Wright-powered Bellanca *Leonardo di Vinci* down to a rough landing at Lahinch, in the Irish Free State. After remaining in Ireland for a few days during which they made repairs to their plane, the fliers took off for Rome but were forced down shortly thereafter. MAY 14-15

S-42 Establishes Another Altitude Mark

CREDIT FOR a new world's altitude record for seaplanes with a 5,000 kilogram load (11,023 pounds) went to the S-42 when Capt. Boris Sergievsky, chief pilot of Sikorsky Aviation Corp., flew the ship to 21,800 feet in tests over Bridgeport, Conn. Raymond Quick, Department of Commerce inspector, went along as co-pilot on the record-breaking attempt. The former record was held by the German pilot Steindorf, who on April 17, 1929, took a seaplane to 6561 feet. MAY 17

Coming Events

Stratosphere Flight

Stratosphere flight under auspices of Army Air Corps and National Geographic Society by Major William Kepner and Captain Albert W. Stevens. Tentative date. JUNE, 1934.

Acrobatic Competition

Coupe Mondaile d'Acrobatic Aerienne, international acrobatic competition at Vincennes, France. 300,000. JUNE 9-10.

Legion Air Race

1934 Legion Air Races. Menominee County Airport, Menominee, Michigan. JUNE 17.

A. S. M. E. Meeting

JOINT AERONAUTICS Hydraulics meeting, American Society of Mechanical Engineers, in cooperation with the summer meeting of the American Association for the Advancement of Science, University of California, Berkeley. JUNE 19-20

At Stamford University, Palo Alto, Calif. JUNE 21

All-Women's Air Race

Third Annual Annette Gipson All-Women's Air Race, Roosevelt Field. 30-mile closed course speed race. Also acrobatic competition by invitation. JUNE 24.

R. A. F. Display

Fifteenth showing of Royal Air Force, with 200 aircraft and 3000 officers and pilots. Exhibition of formation and acrobatic flying and presentation of new service craft. Hendon, England. JUNE 30.

Northwest Air Meet

Northwest Civic Air Meet, Swan Island, Oregon. Under auspices of Northwest Civic Air Meet Association, Larry Therkelsen, managing director, Portland, Oregon. JUNE 30-JULY 1.

Distance-Endurance Contest

Distance and Endurance Contest for 100.000-franc grand prize and 5,000-franc cup. Sponsored by The Aero Club of the West of France in conjunction with the Aero Club of France, Angers, France. JULY 8.

Soaring Meet

Fifth Annual National Soaring Contest, Elmira, N. Y. JUNE 23-JULY 8.

King's Cup Race

Start of King's Cup Race, Hatfield, England. JULY 13

Speed Races

Grand Prix of the Aero Club of France. Speed races between Deauville and Cannes and return for cash prizes and Armand Esders Trophy Cup. JULY 21-23.

Air Tour

Third Air Tour Around Italy. AUG. 1-15.

Women's Air Meet

Women's National Air Meet, Dayton Municipal Airport, Dayton, Ohio. AUG. 4-5.

Polish Tour

International Touring Challenge of the Polish Aero Club AUG. 28-SEPT. 16.

Gliding Contest

Gliding and Soaring Contest, Big Meadows, Shenandoah National Park. SEPT. 15-30.

Bennett Balloon Races

Gordon Bennett Balloon Race. Auspices of Polish Club, Poland. SEPT. 23

State Officials' Meeting

FOURTH ANNUAL Meeting, National Association of State Aviation Officials, Cheyenne, Wyo. SEPT. 27-29.

MacRobertson Race

London-Melbourne International Air Race. Speed and handicap event. Under regulations of F. A. I. and competition rules of Royal Aero Club.. Sponsored by Sir MacPherson Robertson. OCT. 20.

MEMO *from* FLEETWINGS INCORPORATED

TO CHIEF ENGINEERS:

THE "SHOTWELD" SYSTEM OF
STAINLESS STEEL CONSTRUCTION
has these advantages--

① Timing, pressure and current scientifically accurate for every job. Machine controlled!

② The patented "Shotweld" process does not weaken the surrounding metal or weld.

③ The "Shotweld" itself and the Stainless Steel are proof against corrosion (even in salt water).

Write for information re: ribs, wing beams and control surfaces.--

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FLEETWINGS INC. ROOSEVELT FIELD • • •
GARDEN CITY • NEW YORK

America Welcomes The

IMPROVED AERONCA

- *Airwheels*
- *Oleo Landing Gear*
- *Dual controls*
- *Side-by-side cockpit*
- *Real visibility*
- *77 m.p.h. cruise*
- *93 m.p.h. top*
- *28 miles per gallon*
- *Extra - saftey construction thruout*

WITH the improved reliable Aeronca engine it cruises faster, farther and more economically. New low-drag landing gear, advanced streamlining, improved wing design offer better appearance, more speed, cheaper operation to private owners, flying schools and commercial operators.

Aeronca's famous ruggedness, hands-off stability, and dependability have not been changed. Aeronca is unchallenged under $2,000 for completely satisfactory commercial, instruction or pleasure flying.

Write for interesting new booklet, "Flying In Its Safest and Most Economical Form."

AERONAUTICAL CORPORATION OF AMERICA
LUNKEN AIRPORT AERONCA CINCINNATI, OHIO

EXCLUSIVE AGENT FOR THE TRIANGLE PARACHUTE
MANUFACTURED AT CINCINNATI, OHIO

JACOBS 225

JACOBS ENGINES SYMBOLIZE THE ULTIMATE IN ENGINEERING PRACTICE, MATERIALS AND WORKMANSHIP. SINCE ITS INCEPTION THE JACOBS AIRCRAFT ENGINE CO. HAS STOOD FIRMLY BEHIND ITS PRODUCT. JACOBS' SERVICE POLICIES GUARANTEE CONTINUITY AND INCREASING GOOD-WILL TO AIRCRAFT MANUFACTURERS, DISTRIBUTORS AND DEALERS WHO USE JACOBS ENGINES

JACOBS AIRCRAFT ENGINE COMPANY
POTTSTOWN, PA.

(Continued from preceding page)

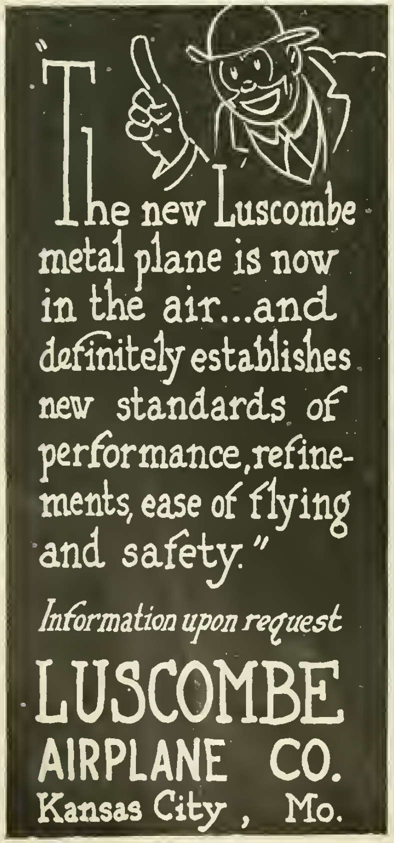
March Exports Reach $1,030,727

EXPORTS OF American aeronautical equipment continued their favorable trend during March, 1934, when $1,030,727 was realized from the sale of aircraft, engines, parachutes and parts and accessories to 47 countries. 21 airplanes and 105 engines constituted the bulk of the value of the shipments.

Among the purchasers was Germany, who took 47 engines, parts and accessories valued at $257,744. Russia purchased engines worth $111,457, while China spent $108,716 for 1 plane, 8 engines and parts and accessories. Brazil and Colombia spent $106,144 and $78,424 respectively to rank among the largest importers. Switzerland spent the greatest amount for aircraft, $65,000; Germany for engines, $249,480; Portugal for parachutes, $3,627, and Argentina for parts and accessories, $32,880.

The 21 planes represented a total value of $304,896, while the 105 engines were worth $520,641. Parachutes and parts and acessories sales total $3,879 and $198,762 respectively, and in addition $2,449 was taken in from sales to Hawaii and Puerto Rico.

Total export sales for the past six-month period amounts to $4,805,521, of which $2,931,286 was for the first three months of 1934.



"The new Luscombe metal plane is now in the air...and definitely establishes new standards of performance, refinements, ease of flying and safety."

Information upon request

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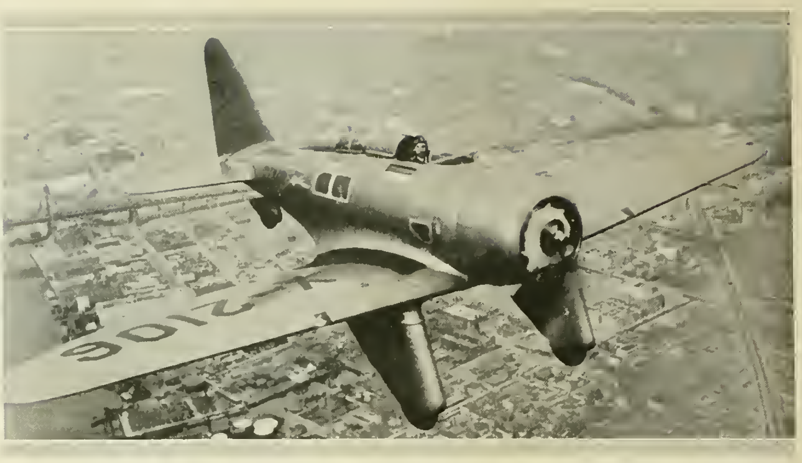
AIRPLANE CO.
Kansas City, Mo.



Wright-powered Seversky with its new land-gear installation

Sixteen New Monocoupes Sold

WITH PRESENT business sufficient to carry on operations for the next four months and three times as great as that for the entire year 1932, Monocoupe Corp. reports having received an order for 15 planes for the Aeronautics Branch, Department of Commerce.

In addition, another Monocoupe was sold to Gottlieb Steiner, Villa Park, Ill., through Midwest Airways, Inc., operating from the Milwaukee County Airport, Milwaukee, Wis. Steiner, a sportsman pilot, will use the plane, which is Warner Super-Scarab powered, for pleasure purposes.

At present, Monocoupe is employing 125 persons at the factory on Lambert-St. Louis Municipal airport and 55 more at its engine plant in Moline, Ill. Both companies are subsidiaries of the Lambert Aircraft Corp., Robertson, Mo.

State Development Sought

THE WASHINGTON State Aeronautical Association was formed in Wenatchee to obtain coordinated development of aviation in the state. Ed. Lee was chosen president; W. W. Conner, vice-president and C. C. Williams, secretary. Gov. Clarence D. Martin and Lacey Murrow, state director of highways, were present at the initial meeting.

The organization has 39 directors, one from each county and an executive board of five, chosen by the directors. Speakers at the meeting were Major Breene on air defense; Ellsworth French, airport improvement; Lieut. H. R. Wallace, aerial photography; E. Thorp, development of airports and Roger Barth, history of Felts Field, Spokane.

DeWeese New Stinson President

FOLLOWING THE resignation of L. B. Manning as president of the Stinson Aircraft Co., of Wayne, Mich., directors of the company appointed B. D. DeWeese to fill the vacancy. DeWeese has been vice-president and general manager of the Stinson company since 1930.

Kinner Business Maintains Pace

CONTINUED IMPROVEMENT in business is reported by Robert Porter, president of Kinner Airplane & Motor Corp., Ltd., Glendale, Calif., with a number of new ships sold and three more dealers appointed to handle sales of Sportwing and Sportster aircraft.

Among the new Kinner owners are: George A. Doyle, Hemet, Calif.; Joseph W. Harper, Hollywood, Calif.; E. A. Legault, Oakland, Calif.; Lester Arter, Los Angeles, and R. P. Bowman, Kinner dealer in the San Francisco Bay region.

Marshall George has purchased a Sportster for instruction and demonstration work having been appointed associate dealer in the Bay Region, while Hangar Six, San Antonio, Tex., and Butte Aircraft Co., Butte, Mont., both have been appointed dealers and taken delivery of Sportsters.

Offering of 399,680 shares of common stock to shareholders at 50 cents a share by the company is contemplated in a registration filed with the Federal Trade Commission in Washington.

Pan American Airways Nets $898,488

ACCORDING TO the sixth annual report of Pan American Airways Corp., submitted to stockholders by Juan T. Trippe, president, the company showed net earnings of $898,488 or $1.42 a share for 1933, compared with $698,527 or $1.36 per share in 1932.

Mail traffic was up 18 per cent in 1933 as compared to 1932 while express volume showed an 80 per cent increase and passenger traffic a 40 per cent rise.

The report said 27,511,000 passenger miles were flown compared with 19,571,000 in 1932; 4,330 miles were added to the company's airway system and the number of airports in the service were brought to 160.

Pan American Airways has been flying a passenger, mail and express service to South America for a number of years.

(Continued on following page)

Boeing School
offers

HOME STUDY COURSES
—FOR MEN IN THE INDUSTRY

Now men in the aeronautical industry can take home study courses in various phases of air line operation at nominal cost. As an example, one-third of the employees of United Air Lines have already enrolled for one or more of these 4 special Boeing Extension Courses:

1. AIRCRAFT COMMUNICATIONS
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4. AVIGATION, METEOROLOGY and AIRCRAFT INSTRUMENTS

Each of these courses offers a means of improving your opportunity. Each was prepared for people *already in aviation.* Prices have been purposely kept low, with extended monthly payment privileges if desired. *Write to us today, for full details, addressing:*

BOEING SCHOOL OF AERONAUTICS
Extension Dept., Hangar 5D
Oakland, California

FLY TO THE SHORE
WHILE SUMMER IS
on the wing

Bader Field, the fine Atlantic City airport, is within easy flight of wherever you are. We'll be glad to meet you there and whisk you away for a glorious seaside holiday. ● If the smell of ocean fills you with an urge for action, vent it on the beach at our door. Take a tingling plunge in the surf. Then enjoy a smoke in a gay cabana's shade. Toast on the sand while a salt breeze blows your cares out to sea. Golf and tennis will wait till tomorrow. Fishing too. In the evening, dances, entertainments and countless resort attractions will keep you going at a happy pace. ● Or, if you cherish leisure above exercise, woo it here, undisturbed. Roll up in sunshine on our broad Ocean Decks. Dissolve weariness in our stimulating health baths. Rest or read in the cool, quiet lounges, and dine with the relish of a rescued explorer. ● Whatever you expect of a summer holiday, you'll find it abounding here at Chalfonte-Haddon Hall. Chiefly, you'll find a sincere hospitality and a total freedom from noise and confusion. Write for reservations. Attractive rates. American and European plans.

LEEDS AND LIPPINCOTT COMPANY
Chalfonte-Haddon Hall
ATLANTIC CITY

Takes off like a rocket...

holds its course like a liner...

lands like a feather

That's the WACO
Model F•3

New beauty and gracefulness are added by the rounded fuselage and the more complete fairing, which has been extended to include the lower wing roots.

●

If you are experienced, then all we have to tell you about this ship is that it's a three-place, open-cockpit model—and that it's built by WACO.

But if you're just beginning to take up flying in a serious way, it might not be amiss to inform you that WACO has earned a reputation for building ships that do things as only a WACO can do them.

And this Model F-3 is even more startling in performance than any similar models of the past. Here are higher top speeds and cruising speeds. Here are countless touches of refinement and longer, wider cockpits to add to your comfort and convenience. Here are major improvements that you will surely want on the ship *you* fly.

And how this trim, new WACO zooms up in typical WACO fashion for a quick take-off! How steady it is in flight! How lightly and surely it settles down in the smallest field! How amazingly easy it is to handle!

Two power plants are available... the Continental 210 H.P. radial—and the Jacobs 225 H. P. radial. The Jacobs can be had either with the conventional dual Scintilla Magneto or with Bosch dual battery ignition, which includes a generator.

But let us send you complete information. Or, better still, we suggest that you arrange to take a flight with our local dealer. It will not obligate you in any way. If you do not know his name, write us.

THE WACO AIRCRAFT COMPANY, TROY, OHIO

WACO
AIRPLANES
"Ask Any Pilot"

WACO LEADS IN AIRCRAFT REGISTRATION

(*Continued from preceding page*)

Ease Student Solo Requirements

AN AMENDMENT to the Air Commerce Regulations relating to student airmen, required to have 25 hours of solo flying for an amateur license or 50 hours for the private license, allows them to acquire part of this experience in flights while they are accompanied by private, limited commercial or transport pilots. The student, however, is required to have 10 hours of actual solo time before he can take credit for time in the air while accompanied by a licensed pilot.

The amendment makes it necessary that the student make a thorough study of the Air Traffic Rules and pass an oral examination on these rules given by his instructor, before his first solo flight.

Solo time has been redefined so that "a person is engaged in solo flying when he is in command of aircraft in flight." Formerly, it was necessary that the person being credited with solo time be the sole operator of the controls in addition to being in command of the aircraft.

Shell Awarded Army Contract

THE U. S. ARMY Air Corps has awarded a contract to Shell Petroleum Corp. for approximately 2,740,000 gallons of aviation gasoline, according to Maj. J. H. Doolittle, manager of the company's aviation sales department. The amount contracted for is 96 per cent of the total gallonage of aviation gasoline to be used during the first half of the year in the Air Corps' regular flying throughout the 26 middle western and southeastern states comprising Shell Petroleum's territory. The contract did not include gasoline used in the Army's air mail flying.

Forest Service Makes Aerial Surveys

CONTRACTS FOR aerial photographing of about 10,000 square miles of national forest land have been let by the U. S. Forest Service and about 20,000 square miles probably will be surveyed or photographed from the air by the service this summer. In some cases maps will be made.

Between $40,000 and $50,000 will be used in making the photographs with all work done under contract, some of which have been let for work in national forests and purchase units in Arkansas, Florida, Louisiana, Mississippi, South Carolina and Minnesota. In addition, work will be done in Idaho, Montana, Washington and Colorado.

AIRCRAFT DEALERS HOLD PLANE PREVIEWS

FOLLOWING THE style set by the automobile industry, distributors and dealers of aircraft have been holding previews of their products at many of the fields throughout the country. Over one weekend alone, local distributors at Roosevelt Field for Stinson, Fairchild and Waco planes exhibited the complete 1934 line of new aircraft on the airport. A similar display of Wacos in Dallas, Texas, aroused considerable interest in this innovation.

Fairchild Dealer Appointed

ART BUSSEY, of United Air Services, Floyd Bennett Field, Brooklyn, N. Y., has been appointed Fairchild dealer for the metropolitan area, and has leased Hangar 7 at Roosevelt Field where a Fairchild sales and service base has been opened.

All models of Fairchild planes are on display and available for demonstration purposes. A complete service base is maintained and expert service on Fairchild planes is available through his government-approved repair station.

Seek Bids on New-Type Craft

BIDS FOR 25 small, inexpensive two-seated airplanes, embodying characteristics in design, construction and performance that probably cannot be met by any American plane now in production, have been called for by Eugene L. Vidal, Director of Aeronautics. The bids to be opened at the Department in Washington on July 25, will be for the inspectors of the Aeronautics Branch.

"Our specifications," Mr. Vidal said, "feature simplicity and safety of operation as well as low maintenance and operating costs. Further, the specifications set forth greater visibility requirements than the industry has heretofore been called upon to produce.

"The planes are to have a landing speed of 35 and a top speed of not less than 110 miles per hour and at cruising speeds the engines shall give 20 to 25 miles per gallon of fuel.

Stratosphere Balloon Nearing Completion

THE STRATOSPHERE balloon in which Major W. E. Kepner and Captain A. W. Stevens, U. S. Army Air Corps expect to ascend into the stratosphere is nearing completion at Akron, Ohio. This is the largest single bag ever constructed being of 3,000,000 cubic foot capacity.

In its top, in addition to the customary manually-operated valve, there will be a large valve operated by compressed air invented by Captain Stevens and used to supplement the manually-operated valve. Another feature is an outboard electric motor and propeller for turning the balloon when it reaches the stratosphere.

The gondola which is nearing completion at Midland, Mich., is made of Dowmetal, is almost 100 inches in diameter, is airtight and will be sealed while at high altitudes, and will be the most complete aerial laboratory ever to leave the ground.

The flight is scheduled to take place from Rapid City, South Dakota, sometime this month, depending upon weather and atmospheric conditions. It is expected that the balloon will ascend 70,000 feet and will drift approximately 1,000 miles before descending.

Fairchild Shows Improvement

FAIRCHILD AVIATION Corp. showed substantial improvement during 1933 and sales for 1934 are expected to exceed last year's by 50 per cent, according to Sherman M. Fairchild, president, in his annual report to stockholders. Unfilled orders as of March 31, 1934, totalled $691,120, exceeding the total gross sales of $647,139 for all of 1933.

Net loss for the year was $48,412.92, comparing with $52,674.96 for 1932, with the cost of all tools and engineering research during 1933 being charged off against operations. In commenting upon the report, Fairchild said deliveries for the first quarter of 1934 were more than two and a half times deliveries for the corresponding period last year.

Manufacturer Incorporates

GOLDEN AIRCRAFTS Corp., of Dallas, Tex., was recently incorporated by J. P. Hanks, J. G. Davis, Jr., and E. J. Bond to manufacture aircraft with headquarters in Dallas.

(*Continued on following page*)

WESTPORT—Aviation's Long Range Radio

- When you want the weather, you may want it badly. There are times when you cannot afford to wait for the next periodical broadcast of the nearest station.
- With a Westport, you need not wait. Just twist the dial and you can reach out and pick up two, three, four, five or more stations all around.
- Then, too, you will find a satisfaction in knowing that you can pick up the beam when you are several hundred miles away.
- Westport's performance is unsurpassed by any other aircraft radio receiver in the world today. Yet, its cost is small. It is time to equip with Westport.

Westport AR62T Remote Control.
$24S
Other models as low as $99.50

Pacific Airmotive Corp., Ltd.
United Airport, Burbank, Calif.
Oakland Airport, Oakland, Calif.

America's most modern School of Aviation..

Offers 11 COMPLETE FLIGHT and TECHNICAL COURSES

Those who appreciate the advantages of superior aeronautical training will profit by sending for the handsome new 40-page RYAN catalogue.

U.S. DEPT. OF COMMERCE Approved HIGHEST TRANSPORT RATING

RYAN SCHOOL OF AERONAUTICS
Lindbergh Field
In Sunny SAN DIEGO, CALIFORNIA

AN OPPORTUNITY
for airplane and autogiro operators to increase their operating income:
ACT AS EXCLUSIVE LOCAL
REPRESENTATIVES FOR

KELLETT SKY BANNER ADVERTISING

IN CONNECTION with the extension of our Sky Ads Service throughout the United States, desirable territory is open to responsible firms capable of adding a Sky Ads Advertising Sales Department to their organization for the purpose of increasing their volume of business.

Write or wire for full information regarding this new and lucrative business. The outdoor advertising season is here. NOW is the time for prompt action.

SKY ADS DIVISION
KELLETT AUTOGIRO CORPORATION
ATLANTIC BLDG., PHILADELPHIA

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☆ Yes? Then you're missing something if you are not reading THE SPORTSMAN PILOT. Remember, it is the *only* magazine published whose entire editorial policy and contents are devoted exclusively to private flying. You'll find it being read at the aviation country clubs and everywhere else that sportsmen pilots gather.

Published monthly. $3 a year, two years for $5; or $5 on Combination—a year of THE SPORTSMAN PILOT and a year of AERO DIGEST.

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STINSON PLANE NEWS

Published by the Stinson Aircraft Corporation, Wayne, Michigan—World's Largest Builders of Cabin Airplanes

Reliant's Value Wins World-Wide Approval

Reliability and Economy again enhanced by many new Airliner Transport Features such as Selectu-Glide, Improved Heating and Ventilation, Shrouded Windshield, Vibration Dampened Instrument Panel, better Insulation against noise, new comforts, greater speed and superior stability.

RECENT DELIVERIES of the 1934 "RELIANT"

You Get More For Your Money

when you buy the 1934 Stinson Reliant, four-passenger cabin plane, powered by Lycoming.

With the new Reliant, Stinson brings two of the greatest advances in aviation history to the private flyer. Write for the latest issue of Stinson Plane News giving full information.

Mailed Free—Postpaid

STINSON AIRCRAFT CORPORATION
Wayne, Michigan
Division of Cord Corporation

(Continued from preceding page)

Boeing Awarded Guggenheim Medal

FOR HIS pioneering work in air transportation and achievement in the manufacture of aircraft, William E. Boeing, chairman of the board of United Aircraft & Transport Corp:, received the Daniel Guggenheim Medal, an annual presentation.

This year the award was made by a board having eight members in the United States and seven abroad. The president of this board was Major E. E. Aldrin of the Standard Oil Company of New Jersey with Arthur Nutt, of the Wright Aeronautical corp., acting as vice-president.

Radios Gaining in Popularity

RAPIDLY GROWING use of aircraft radios by private and general commercial airplane operators is indicated by a report of D. W. Smith, president of Westport Manufacturing Co., Glendale, Calif., that sales of aviation radio receivers and ignition shielding made by his company increased 57 per cent during the first quarter of this year as compared with the corresponding period of 1933.

Nine late model Westport receivers are being installed in aircraft for the Auronautics Branch, five in new Kinner cabin planes. Private owners have also evidenced a desire to install radio receiving sets to take advantage of the nation-wide network of radio range beacons and weather report station broadcasts.

General Tire Company Flying Vega

MANUFACTURING operations of the General Tire & Rubber Co. in three countries will be linked together more closely by a high-speed Lockheed Vega which has just been put into commission by the company. Ray W. Brown, in charge of General's aviation sales, is pilot of the plane, which has a cruising speed of 180 miles an hour, is equipped with radio and has accommodations for four passengers and pilot. A Pratt & Whitney Wasp engine is used.

The plane will be used to make flights to Mexico City and Toronto, where General has tire plants and for testing of streamline airplane tires being made by the company.

Sky Ad Company Adds Personnel

C. B. GILBERT, president of Gilbert Flying Service, Inc., New York, N. Y., who recently organized Giro Sky Ads as a division of his company for the promotion of aerial advertising campaigns has added a number of new people to his staff.

H. W. Collie, formerly with Kellett Autogiro Corp., is to take charge of sales and promotion and W. A. Bohannon is in charge of flight operations.

New Boeings Near Delivery Stage

DELIVERIES OF the Model 247-D transport planes being built for United Air Lines, Inc., and the general market by the Boeing Airplane Co., Seattle, Wash., are expected to begin late this month or early in July.

Modified over the Boeing 247, the new planes will have both geared Wasp engines and three-bladed controllable pitch propellers which are expected to provide considerable increase in performance. A feature designed for the comfort of the passenger is a specially-designed rubber attachment fitting installed under the legs of each seat to serve both as vibration absorber and noise eliminator.

Low Gets Austin Executive Post

APPOINTMENT OF Albert S. Low as vice-president and chief engineer of the Austin Co. has been announced by George A. Bryant, Jr., executive vice-president of the company, which maintains principal offices in Cleveland and branch offices in all principal cities.

Low succeeds as chief engineer Harry E. Stitt, who continues his association with the company as consulting engineer. To take Mr. Low's place as charge of the central district in Chicago, the company has appointed Peter C. McCabe.

New Homestead Agent Chosen

THE BECKWITH Machinery Co. has been appointed Pittsburgh distributor for the Homestead Valve Manufacturing Co., Coraopolis, Pa., manufacturer of Hypressure Jenny. The Beckwith company will handle the sale of the Model D in 16 counties in the tri-state area around Pittsburgh.

Texas Distributor Sells 3 Wacos

E. F. BOOTH, Dallas distributor for Waco aircraft, has sold three planes to local pilots which have already been delivered after being flown from the factory in Troy, Ohio.

Among the new Waco owners is Dr. W. E. Massey, who maintains an ambulance plane at Love Field. His latest purchase makes him the owner of two airplanes.

Fairchild Orders Behind Production

DESPITE EXTRA shifts at the Kreider-Reisner plant, Hagerstown, Md., delivery of Fairchild planes is from two to five weeks behind acceptance of orders, and the demand for the new 3-place cabin job has necessitated a production schedule of 20 of these ships monthly.

Last month witnessed the establishment of new dealers in several localities, including W. P. Cutter, Albuquerque, N. M.; R. E. McKaughan and L. H. Pitkin of Houston, Texas, and Capital Airways, Harrisburg, Pa.

Sales were made to D. C. Kneedler, Philippine Islands, who is receiving his third Fairchild, a 3-place cabin; L. G. Mason, Montgomery School of Aeronautics; Malcom Whitaker, Long Island Aviation Country Club; A. N. Pack, Princeton, N. J.; H. Hancock, Mobile, Ala.; Harry Rosenfeld, New York, N. Y., and Robt. E. Adams, Chesterfield, Ill.

Research Laboratories Revised

COMPLETE REVISION of its Detroit research laboratories to meet engine changes during the next few years has been announced by the Ethyl Gasoline Corp., owned jointly by General Motors Corp. and the Standard Oil Company of New Jersey.

Dynamometers have been altered to keep pace with increased horsepower and larger exhaust lines have been installed and radiator and test control equipment improved. The new dynamometer equipment permits testing of engines of 300 horsepower at speeds up to 6000 r.p.m., while new air compression apparatus will supercharge to 30 lbs. per square inch above atmospheric pressure engines up to much higher powers.

PERSONAIRLITIES

(Continued from page 53)

eling by airline. He hangs around on the edge of aviation, keeping his hand in at piloting through a friend who has a Stinson, and taking thankless aeronautical jobs whenever they turn up. For instance, last year he took charge of the ticket end of the Chicago Tribune's air show and did a good job of selling tickets and getting out the crowd. He's still waiting for someone to thank him for it, I believe. He has a son three years old whom he expects to solo sometime this summer. I don't think the boy's solo will be any worse than some of his old man's speeches.

STANAVO
AVIATION GASOLINE
AVIATION ENGINE OIL
ROCKER ARM GREASE

★ ★

The HAMMOND BIPLANE

A DE LUXE SHIP AT

LOW COST

● The 3 place Hammond Biplane fulfills a distinct need for a ship that offers new advantages at low cost coupled with a thrifty economy of operation that puts it in a class by itself. We mean it! If you're interested in a smart handling job—one that has advanced and proved safety features, up-to-date specifications and plenty of reserve "leg push" for speed—look at the Hammond! Here is the choice of design built to meet the needs of sportsmen, serve in commercial use, passenger operation and for student instruction. Send for illustrated booklet or, better still, arrange for a trial ride.

★ ★

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BALLOON AND AEROPLANE

We offer a Grade A fabric which, in addition to meeting A/N specifications, has unmatched uniform strength, is exceptionally free from yarn and weaving imperfections, and is most carefully graded. Higher initially, perhaps, but cheaper ultimately.

Wellington Sears Co., 65 Worth St., N. Y. City

Branches in leading cities

"A Tight Connection All the Time"

TRADEMARK

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THE

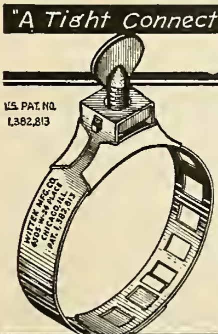
HOSE CLAMP

WITH THE THUMBSCREW

Standard equipment hose clamp of the automotive and airplane industry Your jobber has them

4307 W. 24TH PL. **WITTEK**

CHICAGO, ILL. **MFG. CO.**



Boeing students watch actual operations

while they learn the METHODS

★

BOEING SCHOOL'S location on the Oakland Airport offers an advantage of practical importance: the observation of United Air Lines' sixteen daily schedules with multi-motored transports from this airport alone.

These Boeing 247's represent flying principles successfully *worked out*. United Air Lines' experience of 65,000,000 miles of air-transportation is drawn upon in their servicing and operation. Its western base of operations adjoins the Boeing School building, bringing the results of the world's leading commerical aviation enterprise within a few steps of the classrooms, shops and laboratories where aviation's first steps are being taught.

All theory must check with the facts, here—facts developed on "the line" by United. No other training has a proving ground to equal Boeing School's in scope and stability.

You owe it to your future to compare closely before you decide upon a flying school. The illustrated Boeing Bulletin was planned to help you do so. It pictures the Airport, describes courses, gives costs, enrollment requirements, etcetera. Mail the coupon for your copy.

Next regular enrollment, July 2

BOEING SCHOOL OF AERONAUTICS

Division of UNITED AIR LINES INC.

BOEING SCHOOL OF AERONAUTICS
Room A-6, Airport, Oakland, California

Gentlemen: I am interested in

☐ Boeing Master Pilot
☐ Limited Commercial Pilot
☐ Private Pilot
☐ Airline Operations
☐ Transport Pilot
☐ Special Master Pilot
(Open to holders of Transport Licenses)

Name________ Age____
Years in High School____ Years in College____
Address________ Phone____
City________ State____

FOREIGN NEWS IN BRIEF

Australasia

C. T. P. ULM, with his crew, accomplished their fourth crossing of the Tasman Sea when they flew from Muriwai Beach near Auckland to Mascot in 14 hours 10 minutes, claiming two world and one Australian record for this flight. Approximately 44,000 letters and packets weighing nearly 600 pounds, said to be the largest mail load ever carried, was in the hold of the plane, while it is also claimed that the flight was the longest transoceanic air mail hop. The time set a new Australian record.

IF PRESENT plans mature, China National Aviation Corp., will fly mail and passengers between Shanghai and the once forbidden capital city of Tibet before 1935. Pan American Airways holds a 45 per cent interest in the concern which is American managed and uses American planes and pilots. The journey will take only four days, whereas three months are usually required to complete the trip.

Regular air service now exists as far as Chengtu, capital of Szechuen Province, 800 miles from Lhasa. Airports to be used on the route have already been established at Batan and Kanting.

THE AUSTRALIAN government has accepted the bid of Qantas Empire Airways, Ltd., for operation of the Singapore-Brisbane route of the England-Australia airway. Qantas has purchased five of the new DH 86's, the four-engined, ten-passenger transport which in recent tests showed a top speed of 175 m.p.h. and a cruisnig speed of 145-150 m.p.h. Schedules between London and Brisbane will, during the first few weeks of the service, be on a 14-day plan, but it is understood operations will be speeded up to considerably reduce this time.

DESIGNED BY Wing-Commander Wackett, and built at the Cockatoo Island Dockyard, the Codock monoplane has been completed and test flown by Sir Charles Kingsford-Smith. It is powered by two Napier engines and cruises about 125 m.p.h. After further test flights, the plane will be flown to New Zealand and placed in commercial operation.

AN AIRPLANE, built and designed in Australia may be entered in the MacRobertson race. The ship is the work of L. J. R. Jones, T. D. J. Lynch and D. T. Saville, and is powered by two Harkness Hornet engines. A top speed of 240 m.p.h., and a cruising speed of 200 m.p.h. for 10 hours are expected. Construction costs have been defrayed by public subscription.

D. MILNE, honorary instructor of the Southport (Queensland) Gliding and Flying Club flew a primary glider for 1 hour 55 minutes, beating by 55 minutes the previous Queensland record established by himself. The flight is understood to be 10 minutes longer than any other similar flight in the world.

TWELVE VICKERS *Wildebeest* torpedo bombers have been ordered by the New Zealand government. They will be powered by Bristol *Pegasus* engines and the first of them is expected to reach the country some time this month.

Canada

WORK ON the St. John, N. B., municipal airport has progressed rapidly during the past winter with both runways widened, obstructions removed from one end of the longer runway and its length increased to 2600 feet. Repairs and improvements also were made to the drainage system.

THE ST. JOHN, N. B., Flying Club has decided to sponsor a model airplane contest early this summer and a committee, headed by Dr. Frank Boyaner, has been appointed to prepare plans for the event. Free flying lessons, free flights, etc., will be given to successful competitors and special low flying rates will be offered to all entrants.

Several new students have been added to the club's membership and many other members are prepared to take their license tests shortly. The frozen landing area of the Kennebecasis and St. John rivers facilitated instruction in ski-equipped aircraft.

One of the club's Moths was recently rebuilt while two other club ships are undergoing complete overhaul.

SIX NEW planes for training purposes were purchased by the Royal Canadian Air Force for $80,000, allowing many Canadian airmen, grounded for two months for lack of equipment, to resume flying.

THE ONTARIO Provincial Air Service began its 1934 fire prevention work in northern Ontario on May 8th. Last year, with 22 ships, this government-owned aerial fire fighting service made 2,674 patrols, entailing 19,028 flights, operated at 99 per cent efficiency, and covered 644,508 miles.

AT THE close of 1933, there were 405 private pilots, 474 commercial pilots, 403 air engineers, 49 private planes, 296 commercial planes and 105 registered airports.

539,358 pounds of air mail were flown last year (the largest amount on record) and an increase over 1932 of 125,000 pounds. Practically all the mail flown was in the northern part of the Dominion with 99 percentage of efficiency maintained.

34 intermediate airports were under construction during the winter as part of the unemployment relief program, and one airport was reported finished. Seven more were slated to be started this spring, according to the report. To complete the trans-Canada airport system 37 additional airports must be built.

Canada's government-sponsored clubs logged nearly 10,000 flying hours last year with 68 planes and a membership of 2,075. 120 members obtained private commercial licenses, 26 received commercial pilot licenses, and 500 members were under instruction.

REGULAR AIR MAIL service between Fort Chipewyan, Alberta and Fond du Lac, Saskatchewan is shortly to be inaugurated. Special cachets, now being prepared by the Canadian Post Office Department, will serve to commemorate opening of the service.

DEMANDS FOR service on the Bridge River line have resulted in increasing the schedules to twice a week. Canadian Airways is operating the airline from Vancouver to serve the gold fields in the Bridge River region.

(Continued on following page)

Just after Donati set a new altitude record in the Bristol Pegasus-powered Caproni 14

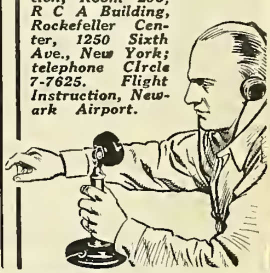
The REPUTATION of a school
DEPENDS ON its GRADUATES!

In less than two years the Casey Jones School of Aeronautics has established an enviable reputation and is acknowledged to be one of the outstanding aeronautical institutions of the country. . . . We take pride in this achievement, which has been made possible because of our experienced personnel, modern equipment and central location. . . . Our greatest satisfaction, however, is in the glowing reports we are receiving from employers concerning the excellent work of our graduates. They are more than justifying our expectations. . . . We have fifteen vacancies in our courses starting July 9th. Write for information concerning our two years Aeronautical Engineering or fourteen months Master Mechanics courses. (Graduates qualified for their Department of Commerce Airplane & Engine licenses.)

Casey Jones School of Aeronautics, Inc., 558 Broad St., Newark, N. J.
LEARN A TRADE PROTECTED BY THE GOVERNMENT

PILOTS:
ATTENTION!

Instruction in Radio Beam and Instrument flight, by new and approved method, greatly reducing flying time required. Trainer instruction, Room 205, R C A Building, Rockefeller Center, 1250 Sixth Ave., New York; telephone Circle 7-7625. Flight Instruction, Newark Airport.



TO COMING AVIATORS
Now you can finish your model airplane in the *real* aircraft finish.

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(*Continued from preceding page*)

Great Britain

INCREASING POPULARITY of the Air Service Training School at Hamble has made it necessary to add personnel, equipment and living accommodations. One new flight instructor has been hired, two new Avro *Cadets* have been purchased and new living and mess quarters have been completed. In addition, the school has begun work on a swimming pool and has specially equipped three *Cadet* trainers for inverted flight.

IMPERIAL AIRWAYS celebrated its tenth anniversary in April, revealing a decade of progress from the inception of the line to the present day. Original equipment consisted of eight different single-engined and twin-engined types, some of them being of military design modified for civil use. Today, the company is flying a sizable fleet of large, multi-engined airliners some seating 38 passengers and a crew of four. Service to India has been reduced from 7¼ days to 5 days while on the Africa route between London and Capetown, the schedule has been lowered from 11 to 9 days.

RE-EQUIPMENT of Royal Air Force units with modern aircraft in place of obsolescent types goes on steadily with a consequential steady improvement in the capabilities of the Force on service in Great Britain and overseas.

New Handley Page *Heyford* twin-engined bombers have replaced old equipment in one squadron and the Blackburn *Perth*, tri-motored biplane boat armed with a quick-firing one-pound gun has taken the place of the *Iris*. New torpedo-planes have been issued to one squadron of the Fleet Air Arm, two auxiliary air force squadrons have been re-equipped with Hart day bombers and one unit has received Westland *Wallace*.

BRISTOL BULLDOG biplanes, similar to the single seaters of the same name but modified to provide another cockpit, have replaced older equipment at one of the R. A. F. Flying Schools and at the Cranwell Cadet College.

All parts of the Bulldog Trainer are interchangeable with those of the single-seater except for the rear end of the fuselage. In emergencies the trainer could be converted into a one-place fighter with high speed by covering the rear cockpit and adding gun mountings, guns, gun gear, belt boxes and ammunition. Radio and oxygen-breathing apparatus may also be carried and four 20-pound bombs may be secured to the lower wings.

France

FRANCE has purchased the rights to use and manufacture the Handley Page automatic wing slots, making it the sixth country to have made an agreement with Handley Page for the use of the slots. The others are Great Britain, India, the United States, Sweden and Finland. In Canada and Italy, the rights are owned by companies specially formed to handle the invention, while in Japan a private company has acquired the naval rights. The slot is used in 34 other countries.

WHILE CONDITIONS in French commercial aeronautics are more favorable, further aid is still required from, and is expected of, the government. Many potential purchasers of private airplanes are finding the initial cost and up-keep a problem. Purchase premiums offered by the government are, however, helping considerably with premiums for planes costing less than $1,316 amounting to $462. For a higher priced plane there is a flat premium of $526 and also $653 for the first passenger, $601 for the second passenger and $329 for the third. In addition, $4.04 is paid for an engine up to 60 h.p., $6.85 if the engine is between 60 and 90 h.p., and $12.12 for an engine from 90 to 120 h.p.

The number of private planes in flying condition at the end of 1933 was 671, the more popular types being Potez (273), Caudron (272), Farman (80), and Morane (33). During the first nine months of last year, 190 planes were delivered for private use, compared with 198 during all of 1932. The number of private pilot's licenses issued in 1933 was 1,033 of which 724 were new.

Italy

S. A. NAVIGAZIONE AREA (S.A.N.A.) has completely overhauled and reconditioned its equipment and now is operating with 15 seaplanes, nine of which are bi-motored, four tri-motored and two four-motored. During its eight years of existence this company has carried 65,000 passengers, 1850 tons of merchandise and mail and has maintained an operating regularity of 98 per cent. Lines are operated between Rome and Tripoli; Rome and Marseilles and Rome and Palermo. Connections to Paris, Barcelona and other important Continental cities are also available.

THE PLANE in which Commander Renato Donati broke the world's altitude record on April 12 at the Monteclio Airport, Rome, is a Caproni 14 powered by a 535 h.p. Bristol Pegasus engine. It is a one-place job of wood and metal construction; span of both wings is about 46.5 ft. and its length is about 27 ft. Donati had prepared for the record-breaking ascent since January, 1934, having made several test flights to more than 32,000 feet to ascertain all operating conditions and to make necessary changes in the craft. His efforts were rewarded with a new record of 47,354.67 feet.

Mexico

CONTENDING THAT income from passenger-carrying activity is insufficient to enable them to continue regular service, several Mexican air transport lines have petitioned the government to grant them mail carrying franchises amounting to about 2¾ cents a ton mile. No action has been taken on the petition

LT. HAROLD BROMLEY, Los Angeles pilot, is now operating in north central Mexico flying gold from isolated mines to various distribution points.

PASSENGER AND MAIL service between Mazatlan and La Paz, capital of the southern district of Lower California Territory, will be resumed by Daniel P. Fort who has been granted permission to continue operations which wree suspended some time ago. Fort will fly a seaplane.

Russia

ALL EXPEDITIONS to the Arctic, both overland and by sea, now include aircraft in their equipment. During the year, it is expected that five large planes, manned by pilots particularly familiar with Arctic conditions, will be on permanent duty in the polar regions. These planes are to help in surveying icefields and in hydrographic work. A considerable amount of aerial photography will also be done, including researches in some of the most remote localities. Establishment of permanent air communication with a number of polar radio stations also is contemplated in the near future.

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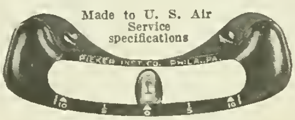

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FOR SALE: Lockheed Sirius with Wasp C. Total time on ship, 200 hours and motor, 320 hours. Both just major overhauled. Equipped with blind flying instruments, electric starter, landing lights, wheel pants, and sliding windshield. Price, $5,500. Andy Stinis, Floyd Bennett Field, Brooklyn, N. Y.

FOR SALE OR TRADE: J-5 Eaglerock with speed ring, tail wheel. Licensed until March, 1935. Will trade for Stinson Junior. WANTED TO BUY: J-6 300 motor. Give full details and price in first letter. L. P. Quinn, Glasgow, Montana.

TRIAD TRIMOTOR: 4PCLM; 3 Leblonds 65, factory overhauled; 242 hours total; recovered, licensed; ideal for trimotor instruction; wonderful barnstormer. $1,500. Frazier, 308 So. 11th, Lincoln, Nebraska.

OX-5 ROBIN: New motor, perfect condition, 30 x 5 wheels, cabin heaters, dual controls, licensed; $650. Turnpike Airport, Westboro, Mass. All types of ships bought, sold and exchanged.

FOR IMMEDIATE SALE or exchange: 12 certified airplanes, as follows: J-5 Waco Seaplane, fully equipped with Edo floats and Heywood air starter, condition like new throughout; J6-9 330 h.p. Straight Wing Waco; Kinner 100 h.p. Fleet; Warner 125 h.p. Waco F; J6-7 250 h.p. Taperwing Waco; OX-5 Robin cabin ship; 2 J6-9 330 h.p. 6-place Travel Air cabin ships; J6 300 h.p. 6-place Stinson cabin ship; J-5 3-place Travel Air, late type; Lycoming-powered Stinson Junior; Wright Cyclone-powered trimotor 20-passenger Patrician. All ships in excellent condition throughout. Photographs furnished if you mean business. Will accept good late model cars on deals. Terms to responsible buyers. Buy now before prices advance. Becker-Forner Flying Service, Inc., Jackson, Michigan.

AVRO AVIAN: Cirrus powered. A-1 throughout; folding wings, air wheels, compass, and wing slots. Extra propeller and motor parts. $575. Knapp, 1499 Winchester Rd., South Euclid, Ohio.

CURTISS JUNIOR: Like new, just relicensed. Will sacrifice for $425. Also Waco 10, Robin and Command-Aire parts. M. F. Steffen, 370 Humboldt Parkway, Buffalo, New York.

WACO F WARNER: Like new; starter, steel prop, pants and ring; complete set blind flying instruments; special windshield. Privately owned; license expires July 1, 1935. John Fitkalo, 3520 Twelfth Ave., Brooklyn, N. Y.

FOR SALE: TP Swallow, good condition, $175. 3-place OXX-6 Swallow, license, price $475. OX-5 motor, good condition, $50. John Ruzicka, Hoxie, Kansas.

FLAMINGO: Wasp C, eight-place, all metal, perfect condition. Ideal passengers, freight. Electric starter, generator, radio, lights. $1,600. Address 1745 Continental-Illinois Bank Building, Chicago, Illinois.

STEARMAN C3B: J-5 engine. Landing lights, steel prop, many extras. Total time ship and motor only 210 hours. Licensed till May 1935. Never cracked. Excellent shape throughout. $1,450. R. J. Young, 1430 Lakeshore Drive, Chicago, Illinois.

RYAN B-1: Travel Air OX; Aeronca two-place; single-place Aeronca. All licensed, in good condition. Raven Rock Airport, Boyers & Clark Flying Service, Portsmouth, Ohio.

BEAUTIFUL RYAN Speedster: Open three-place; J6-5 motor; total 113 hours. Walter Schneider, 4145 Helen Avenue, Detroit, Michigan.

AMERICAN EAGLET: Two-place light monoplane. Excellent shape. Just reconditioned and repainted. Never cracked. Szekely 45, just had major overhaul. Heavy duty landing gear. Will sell immediately for $575. John A. Spensley, 944 E. 43d Street, Brooklyn, New York.

WARNER 110 h.p.; used. For sale as is or will sell parts. Reasonable. Rafus Flying Service, Greensboro, North Carolina.

WACO F; Loening Commuter; Robins; Taperwing, Bird, Stinsons; Curtiss Jr., Moth, OX-5 planes, etc. Time payments can be arranged. Pioneer Aviation Co., Airport, Syracuse, N. Y.

B-5 RYAN: 6-place cabin monoplane powered with completely modern J-6 330 h.p. Wright Whirlwind. No reasonable offer refused. A. Deemer, Jr., 327 Western, Brookville, Penna.

FOR SALE: Wright Whirlwind J6-5 175 h.p. motor. Also J6-9 330 h.p. motor. Both in need of overhaul. Submit us best cash offer. Michigan Aero Motors, Jackson, Michigan.

STINSON SR.: 330 h.p., six-place, has ATC for floats. Travel Air: 175 h.p., model E-4000. Driggs Skylark powered with 75 Rover. Waco 10, OX-5 motor. Will accept ships or late cars in trade. Terms. Central Air Service, Grand Rapids, Mich.

LAIRD SPEED WING: Wasp C; total time, 240 hours; extra instrument; full NACA cowling; cruises 160; excellent condition, $3,500; cost new $21,000. Louisville Flying Service, Louisville, Ky.

$1,200 TAKES J-5 Travel Air in perfect condition, fully licensed; ship and motor 400 hours, just recovered; always hangared; complete instruments, brakes and metal propeller. AERO DIGEST, Box 1803.

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Used Planes and Engines

FOR SALE OR TRADE: Warner Waco F, A-1, $1,475. Warner Waco F, like new, $1,575. Wright J6-5 Waco, A-1, $1,375. Wright J6-5 Robin, A-1, $1,175. Omaha Aircraft Brokerage Service, South Omaha, Nebraska.

WACO 10: OXX-6 motor, five hours since top overhaul. Ship completely recovered in June. Full Airwheels. Wings painted silver, fuselage Stearman Vermilion. Ship and motor in A-1 condition. A real buy at $425. License NC-1685. K. F. Stuhldreher, 46 Erie St., North, Massillon, Ohio.

ROBIN J6-5: 140 hours; Stearman J-5, night flying equipment, instruments; Fairchild 5-place J-6 330, floats or wheels. Chuck O'Connor, Barnes Air Service Co., Westfield, Mass.

GEE BEE SPORTSTER: Model E. Cannot be told from new. Only 140 hours ship and motor. Cruises 120 m.p.h.; top 150 m.p.h. Burns 6½ gallons per hours. Robinson Air Service, Municipal Airport, Rochester, New York.

OX COMMAND-AIRE: 220 hours. New motor, prop, tires. Several ribs need slight repair, otherwise perfect condition. Robinson Air Service, Municipal Airport, Rochester, New York.

WACO STRAIGHT WING: J-5, engine and ship just had major overhaul. Also Great Lakes and OX-5 Swallow. Reasonably priced. Air Activities Airport, West Chicago, Illinois.

STINSON LYCOMING JR.: Late 1930, licensed April 1935. Has had splendid care, never cracked; guarantee 800 actual hours, rate bargain, $1,275. No less. Jones Repossessed Car Sales, 121 Alexander St., Rochester, New York.

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AMERICAN CIRRUS Inverted engine. Guaranteed brand new and complete with magnetos and carburetor. Price $425, subject to inspection. Trade-in considered. AERO DIGEST, Box 1804.

FOR SALE: Waco four-place cabin, late 1933 model; flares, landing lights, radio; total flying time, 75 hours. Will sacrifice. AERO DIGEST. Box 1808.

FOR SALE: Curtiss-Wright Junior, late model. Ship 118 hours, motor 138 hours total time since new. Just relicensed till June 15, 1935. Bargain at $450, cash, or trade for 1933 or '34 Ford, Chevrolet or Plymouth. Henry Saunders, R. D. 1, Johnson City, New York.

GREAT LAKES 2T1A: Latest model. Equipped for blind and night flying. Like new throughout. Consider trade and cash. $1,650. T. E. Byron, 14745 Coit Road, Cleveland, Ohio.

FOR SALE OR TRADE: Curtiss-Wright Jr., licensed. Always hangared; 160 hours total time; motor just completely overhauled; never cracked. Selling this ship cheap. First come, first served. All propositions considered. P. O. Box 696, Paducah, Kentucky.

FOR SALE: Identified OX American Eagle. New covering, new prop. Price $275. E. M. Jones, Cold Spring, Minnesota.

FOR SALE OR TRADE: Aeronca C-2. This ship has been completely rebuilt. New style drilled crankshaft, con, rods, pistons, rings, pins, valve lifters, cowling, fuselage covering, new split gear, Goodrich air wheels. New $45 Hartzell. Trade for late car. Sell $400. O. F. Milligan, 1609 First Avenue, Middletown, Ohio.

SAVE 40% on just completed new Ken-Royce 165 h.p. Continental-powered three-place biplanes. The finest, sportiest, most beautiful custom-built three-place biplanes on the market. Offered subject to prior sale at big money-saving prices. Write to wire Rearwin Airplanes, Inc., Fairfax Airport, Kansas City, Kansas.

FLYING BOATS, AMPHIBIONS: Ireland, 5-place cabin, Wasp motor; Boeing 6-place cabin Wasp, 140 m.p.h.; Viking, 4-place open. "B" Wasp and J-5 Ireland parts. Curtiss Air Station, Atlantic City, New Jersey.

STINSON DETROITER: 6-place in perfect condition, $1,350. Cruises 105, range 700 miles loaded. Real money maker. Licensed March 1935. Write Spencer Radio, Akron, Ohio.

WACO QCF: Continental 165, special instruments front and rear cockpits, starter, two hours since motor overhaul, ship perfect. See or call T. W. Robertson, Hadley Airport, New Brunswick, New Jersey. Dunellen 2-6928.

FOR SALE: Curtiss-Wright four-place sedan with latest type 185 Challenger. Just completely recovered, special hand-rubbed finish; light cream, leading edges vermilion, wires chromium. Motor overhauled, perfect condition. Special equipped, Hamilton steel propeller, electric starter, navigation lights, recessed landing lights, flares, blind instruments, clock, semi-airwheels, motor ring, electric booster, electric cigar lighters. Ideal for executive or personal plane. Comfortable, efficient and economical. Most beautiful ship in central United States. Always privately owned. Outstanding bargain, $2,500. Trades considered. Curtiss-Reed propeller, just overhauled, $50. W. P. Corrington, 1220 West 9th Street, Cleveland, Ohio.

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CURTISS SEA GULL: Four-place flying boat, completely rebuilt. No time since overhaul. Beautiful, economical job. Price $1,200. May consider land job as part payment. Roger Pennock, 501 Cooper Street, Camden, New Jersey.

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FOR SALE: Whitey Sport 2-place, Velie M-5 70 h.p.; semi-air wheels, like new, only 16 hours; $350. New Velie M-5, 70 h.p. motor, sacrifice, $250. OX Waco 90, in perfect shape, N. C., $575. G. W. Wiegman, 1016 - 28th Street, Des Moines, Iowa.

Wanted To Buy Or Trade

WANT OX-5 WACO GEX or 10. Motor condition no object. Would consider Command-Aire. Pay cash. Give full information. Box 451, Joplin, Mo.

WANTED: Complete set of struts, fittings and cross wires, water rudders, for DeLuxe floats for Waco 10. Frank Mills, Essington, Pennsylvania.

WANTED: Kinner or Warner Bird, Waco F or similar ship, for cash. Must be in excellent condition and priced right. AERO DIGEST, Box 1792.

WANTED: Curtiss D-12 motor, complete and in good condition. Want one Szekely complete or incomplete. Send full details and lowest price. AERO DIGEST, Box 1791.

WANTED: One OX-5 Curtiss Robin fuselage that is licensed or eligible for license. Carl Anderson, Bowman, North Dakota.

WANTED: C K model 4-place Bird, in good condition. Will pay cash; price must be right. Glenn T. Clark, 803 Sixth Street, Charleston, W. Va.

WANTED: Two-place Aeronca or similar ship. Must be licensed and in good condition. Will pay cash. Gilbert Reineke, Route 2, Waseca, Minn.

WANTED: Left wing for 30 h.p. American Eaglet. Must be okay for license. Prefer uncovered wing, less aileron. Give details. A. C. Fowler, Hurricane, West Virginia.

WANTED: Waco 10 motor cowling, OX-5, good; set 750 x 10 wheels and tires; licenseable Waco 10 fuselage, good or cracked; Miller overhead for OX-5. J. J. Williams, 920 Forest, Kansas City, Missouri.

WANTED: Travel Air 2000, in good condition, less motor. Also landing gear, radiator, propeller, windshields, etc., for same. Write Edward Minter, 1415 10th St., N.W., Roanoke, Virginia.

WANTED: Fairchild Caminez Cam motor. Give details. Write Vern K. Fry, Route 4, Logansport, Indiana.

WANTED FOR CASH: Part or all of low pressure wheel and tire assembly for 1400 pound airplane. Brakes and roller bearings preferred. N. F. Scudder, Route 3, Hampton, Virginia.

WANTED: Recent models standard open and cabin planes, 2- to 5-place. Must be perfect condition and cash bargains. Give complete information. Fred Block, Peoria, Illinois.

WANTED: Stinson "S" right wing, undercarriage, fin, rudder, tail wheel assembly, bank and turn, rate climb, stabilizer level. Earl E. Bach, Philadelphia Airport, Philadelphia, Penna.

WANTED: Steel hangar. Size not less than 50 by 60. Must be in fair condition and within reasonable distance of me. A. Deemer, Jr., 327 Western, Brookville, Penna.

HAVE CASH for planes up to 330 h.p., open or closed, in any condition. Give all details and price in first letter. AERO DIGEST, Box 1807.

WE WRECK THEM FOR PARTS: Will buy or sell new or used airplanes, wings, fuselages, struts, landing gears, motors. Pioneer Aircraft Parts, c/o Airport, Syracuse, New York.

WANTED: J-5 Standard, the best buy we can get; must be a bargain. Send details first letter, immediately. Hoffman Plantation Airways, Leland, Mississippi.

VELIE MONOCOUPE, wanted, 32-ft. wing, good shape, licensed and reasonably priced. Give complete description. Write Watertown Air Lines, Box 614, Watertown, South Dakota.

WANTED: Warner Stinson left landing gear Vee, both left wing struts; and OX Travel Air motor-mount, landing gear (less right axle), four panels, some struts and wires; or will sell parts I have. Box 329, Malone, New York.

WILL BUY major crackup, any make or model considered. Give details of damage and price. Must have all parts. Midwestern Aviation Corporation, Seymour, Indiana.

WANTED: For Davis V-3 Monoplane, right center section struts, V-brace and wires, right landing V and shock struts. AERO DIGEST, Box 1809.

J6-9E and WASP JUNIOR engines wanted: Must be in good condition. State cash price and give history and complete details. TACA, Tegucigalpa, Honduras, Central America.

WANTED: One Aeronca C-2 fuselage. For sale: Heath motor with prop. H. Luzader, 102 East Main Street, Somerset, Pennsylvania.

WANTED: For cash, airplane, any condition that can be repaired and licensed, less engine. Must be east of Mississippi. Give complete details and lowest cash price. AERO DIGEST, Box 1805.

WANTED: Waco F Warner or Kinner. Reply fully, giving history and lowest cash price. Lyons Battery & Electric Co., 2503 Union Ave., Altoona, Pennsylvania.

Miscellaneous Products & Equipment For Sale

OXX-6 MOTOR, less cases. Also 2 Scintilla mags for same in perfect condition, $60. Ed. Donahue, 5954 Colgate Street, Philadelphia, Pennsylvania.

AIRPLANE TOW BANNERS with scientifically built detachable letters. 1934 prices and terms. Discount to dealers. Your chance to make more money. Light plane banners. NEED three chutes, 3 sirens, 3 Aeromarine 60 h.p. motors; 1 Rearwin Jr. plane; 1 Waco 165 or 125 F. WILL SELL Taylor Cub, 600 hours, latest Continental motor; new, perfect, ready to go, $950 cash. Also new A-40 shaft. R. V. Trader, Mfg., Dravosburg, Pennsylvania.

LYCOMING, J6-9, J6-5, WASP motor parts. Starter, generator, spark plugs, instruments. Very reasonable prices. Inspection granted. AERO DIGEST, Box 1793.

FOR SALE: All metal hangar; 80 x 60; priced right. Would consider trade for light late model airplane. W. C. Stroube, 306 State National Bank Building, Corsicana, Texas.

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Miscellaneous Products & Equipment For Sale

FOR SALE: 2 Scintilla magnetos. Brand new Model V-AG9-D, $20 each. Fred Vilsmeier, 857 E. Luzerne St., Philadelphia, Pennsylvania.

FOR SALE: OX Command-Aire trainer parts complete; motor, prop, wings, etc. Bruno Cetin, 255-10 147th Drive, Rosedale, L. I., N. Y.

J-5 HAMILTON metal prop. OX Command-Aire upper right wing and tail surfaces. 20 x 9-4 Goodyear Airwheels, hubs, tires, tubes. Any reasonable offers considered. Airview Flying Service, Red Bank, New Jersey.

FOR SALE: Wings, tail units, fuselages: Travel Air, Waco, N-B Trainer, Eaglerock, Swallow, Waco Taperwings, primary gliders, wing covers, miniature cars and a complete stock of new material. Williams-Raithel Aircraft, Gill, Mass.

OX-5 motor, hub, stacks, $25. Knauf Flying Service, Punxsutawney-Braehreeze Airport, Marchand, Pennsylvania.

STINSON SM8A PARTS: Right wing, aileron, struts, doors, oleo struts for air wheels, fin and rudder. Earl E. Bach, Philadelphia Airport, Philadelphia, Pennsylvania.

TP SWALLOW PARTS: New, used; wings, fuselage, mount, etc. OX-5's and parts; also three-place parts. One OX prop. AERO DIGEST, Box 1802.

PARTS FOR ALL SIZE ENGINES: 50% to 80% off list. Buy and sell all kinds of instruments, wheels, tires, propellers, generators, starters, engines, dirt. Have complete cracked up Velie Monocoupe. Aircraft Salvage Company, 21-75 48th Street, Astoria, L. I., N. Y.

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WINGS: Try our wing exchange. Trade your wrecked wings for rebuilt or new ones. We also have spars, ribs and struts. New London Aircraft Co., New London, Ohio.

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ENGINEER: B. S. degree. 5 years' experience in airplane drafting, design, and stress analysis. 29, single. Experience with Consolidated, Stearman, Corben. George Barton, Albany, Wisconsin.

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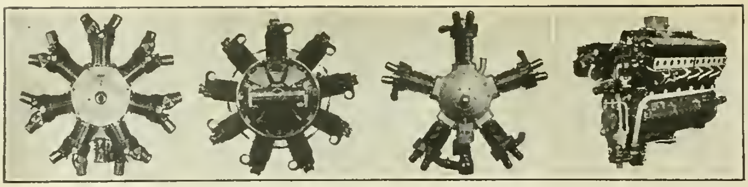

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